OOD MANUFACTURE

CALIFORNIA

FOOD MANUFACTURE

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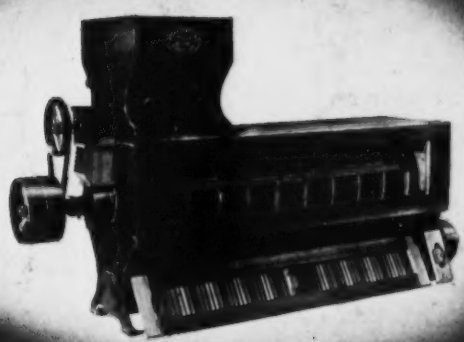

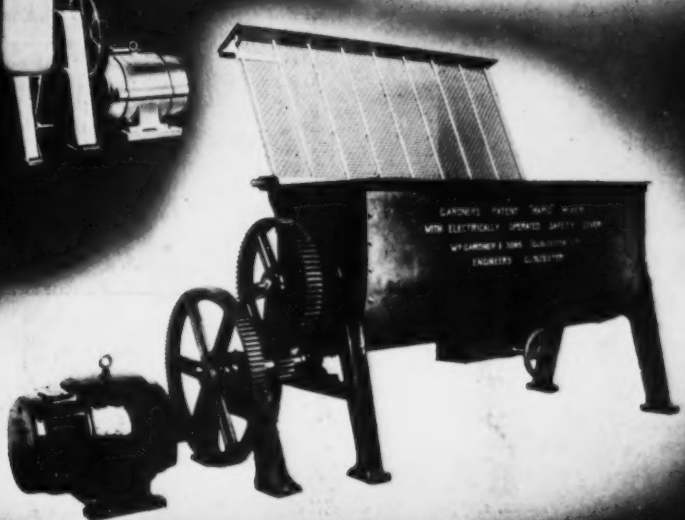

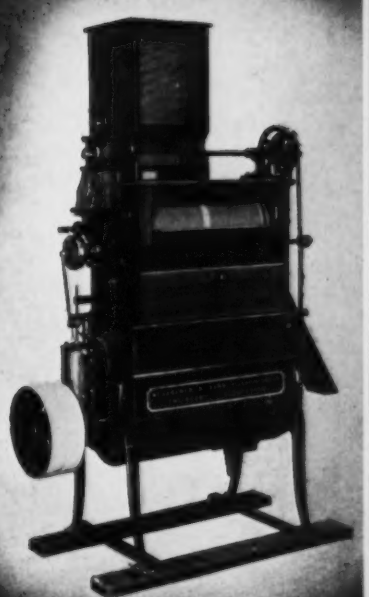

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A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF ALL EDIBLE COMMODITIES INVOLVING A PROCESS OF MANUFACTURE.

FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME . . . XIV

NUMBER . . . 9

SEPTEMBER 1, 1939

Flour Confectionery Number

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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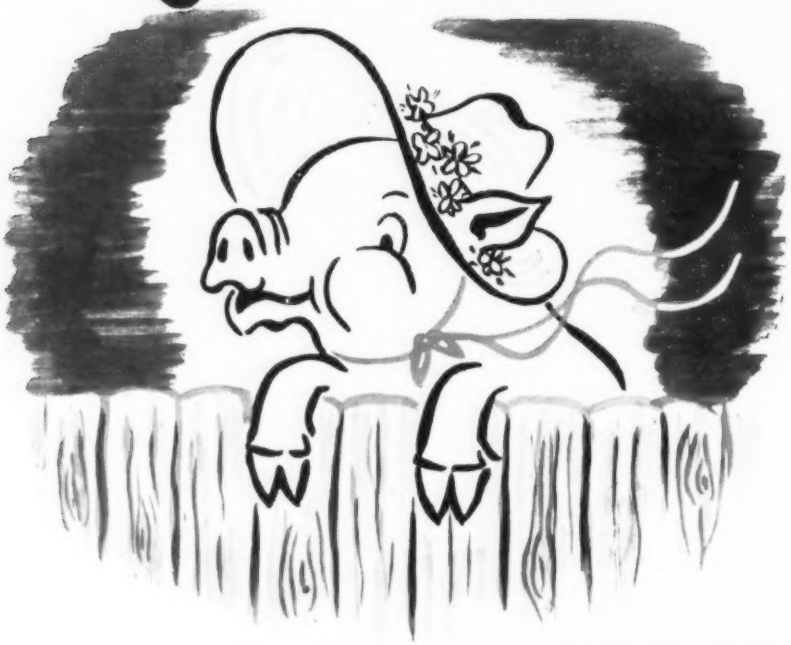

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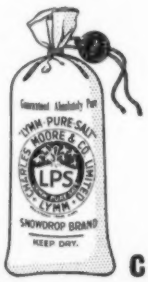

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XIV, No. 9 September 1, 1939

Colonial Nutrition Problems

REFERENCE HAS been made from time to time in these columns to the maladies brought about by malnutrition in different parts of the world. These problems are very noticeable in our own colonies, where abundance and deficiency are found side by side. Writing of the West Indies, a writer mentions " malnutrition in a land of natural plenty ". Much more attention is being paid these days to such matters, and when statistics have been accumulated and analysed it may be possible to do something about it.

During the last few weeks articles have appeared in the *Lancet* concerning a deficiency of vitamin B in East Africa, a deficiency causing endemic glossitis in Palestine, a deficiency of vitamin B_2 complex in the Straits Settlements, and a deficiency of vitamin A in Ceylon. It sounds as if the Empire were going rotten!

This is no sudden discovery. Over three years ago the Colonial Secretary asked all colonial governors to report on standards of nutrition. A committee was set up to analyse the replies and make recommendations. This committee has just issued its report, which is in two parts, the first consisting of general information about colonial dietaries, a statement of the principles of nutrition and practical suggestions for improvement. The second is a summary of information regarding each territorial unit of the Empire.

Vegetarian Diets

From the report it is evident that colonial dietaries are predominantly vegetarian and only very small quantities of animal products, especially milk, are consumed. In many cases the people rely on a single crop. As a result, there is a deficiency of proteins, calcium and phosphorus. The diet is usually low in fats, fruits and green leafy vegetables. Deficiencies of all the vitamins except D are widely reported.

The committee believe that the two main causes of malnutrition in the colonies are (apart from diseases) the low standard of living and ignorance, often combined with prejudice. There must be improvements in agricultural production, and the answer to a deficient dietary is an efficient agriculture. Balanced agriculture is the need.

The very low consumption of milk in the colonies is astonishing, and practically none is consumed after weaning. While it is admitted that fresh milk may be a dangerous beverage in tropical countries, dried milk is not open to these objections and greater use could be made of this. Suggestions are also made for the development of fisheries and for the introduction of different crops.

It is interesting to note how (according to the appendix written by Dr. Platt) it is possible to live on well-milled rice as a sole staple food without developing beri-beri. The rice must be stored in such a way as not to lose its vitamin B_1, it must not be washed before being cooked, and there must be no superfluous water at the end of cooking.

Potato Marketing Scheme

Some time ago we referred to the objections which were lodged by the Food Manufacturers Federation and the Fruit and Vegetable Canners Association to the Potato Marketing Board's proposed amendments to the scheme. The public enquiry was a full-dress affair; many K.Cs. and juniors were briefed, and the hearing lasted for twelve days. The opposition was mainly centred round the proposal to give the Board powers to manufacture potato products.

The Minister of Agriculture has now received the report and considered it, and has decided to modify the amendments and has placed the draft before Parliament for approval.

One clause to which much objection was raised allowed the Board to produce human foods in the form of dried slices, flakes, dice, chips or flour, chipped, diced, sliced or whole canned crisps or chips fried in fat or oil. This has now been altered to " Human food in the form of dried slices, flakes or flour, provided that the slices or flakes are not subjected after drying to any further process by cooking or to any process of canning ". That is a very different matter.

The clauses allowing for the production of alcohols and synthetic organic chemicals, plastics and synthetic resins have been withdrawn. The points raised by the objectors have been allowed practically in full, and the Board is not to be allowed to spread itself as it would have liked.

London's Water

Recently a party of members of the London Medical Society visited the Kempton Park Waterworks and, as a result, obtained much interesting information about London's water business. It is indeed a business, for over 310 million gallons of water are consumed every day by a population of eight million.

London's supply is from the Thames and the Lee, and also from many artesian wells sunk into the chalk and greensand. It is amazing how pure the deep well water is, and organic pollution is extremely rare, but in many cases it is chlorinated before it passes into the supply. The river water is not so pure, and as this constitutes four-fifths of the total consumed the handling of the water from the rivers is a more complicated affair.

There are three stages of purification: storage, filtration and chlorination. The storage, apart from conserving the supply, has a marked effect on the amount of bacteria present. *B. coli*, which is often present in 1 c.c. of raw river water owing to sewage pollution, may be absent in 100 c.c. after a month's storage.

When the water is pumped from the reservoirs, one of which—the Queen Mary—holds nearly 7,000 million gallons, it passes through rapid mechanical filters to remove suspended matter, which mainly consists of algæ and silt. These are followed by secondary filters composed of fine sand. By this time bacterial contamination has been reduced to a very small degree.

Finally, the water is treated with ammonium sulphate and then chlorine at the rate of 0·35 part per million. This ensures that the water is free from *B. coli*.

Very few of the big consumers of water in the food industries realise how much is involved in producing a pure supply and what dire effects might result on their products if the vigilance were at any time relaxed.

Food Storage

The provision of adequate supplies of food reserves, a policy which was originally advocated in this journal before any interest had been taken in it elsewhere, has seized the public imagination. When we published our article "Are we Prepared?" in April, 1936, people just shrugged their shoulders, M.Ps. ignored it and the Government took no notice.

To-day Mr. Morrison must be getting rather tired of the almost daily bombardment to which he is subjected, of questions relating to Government food reserves. He has been unable to evade the issue. Our M.Ps. are persistent fellows, and they can actually see a thing when it is thrust right under their noses.

Mr. Morrison has made it clear that in framing its policy in regard to reserves of all kinds, including foodstuffs, H.M. Government had taken into account all relevant considerations, including factors affecting the maintenance of our overseas trade in time of war. The Government's reserves are those of essential foodstuffs and the particular commodities are selected having due regard to their relative cheapness and high food value. Normal imports include large quantities of high-priced food which would not be essential in an emergency.

Mr. Morrison admitted that a substantial addition has recently been made to the Government's wheat reserves. He would not say how much the increase was, but said it was substantial. We believe that the position is now infinitely better than it was a year ago. Bakers all over the country are holding increased stocks of flour and millers are to do the same. This means that increased reserves are available at the spot where they will be wanted and no transport will be needed. This is all to the good, but the Government must not be allowed to rest on their laurels and we hope that the bombardment will continue.

Fish Oils

"The value of fish body liver oils for medicinal use lies in their vitamin A and D content. Since it has been abundantly demonstrated that these products vary greatly in such content, new data concerning commercial or laboratory specimens of known origin appears worth recording."

This is the introduction to a report of a very painstaking piece of work (published in the current issue of *Food Research*, performed by Agnes Fay Morgan, Louise Kimmel, and Helen G. Davison, at the Laboratory of Household Science, University of California, Berkeley, California.

Work was started in September, 1934, and is reported up to January, 1938, and consisted of the examination of numbers of samples of fish oils for vitamin A and D content.

Summarising their work the authors say that eight out of eleven spot and composite samples taken from one large run in the late 1938 season were at least equal to the U.S.P. reference cod liver oil in vitamin D content and contained more than 100 Lovibond blue units per gram.

Seven commercial salmon offal oils contained 58 to 142 units of vitamin D per gram, two pink salmon oils being the richest in this factor. The vitamin A of four of these oils approached the minimum standard for U.S.P. cod liver oil.

Three laboratory-extracted tuna liver oils were found to contain 35,000 and 54,000 units of vitamin D per gram, and a somewhat larger content of vitamin A.

Two lots of freshly extracted mackerel liver oil had 2,700 and 54,000 units of vitamin D per gram and 16,000 and 211,000 units of vitamin A. Two later samples, autumn catch, 1937, had 76,000 and 30,000 units of vitamin A per gram. The oil content of these livers was in inverse relation to the vitamin value of the oils.

The conclusion was reached by the authors that there is no predictable relation between the vitamin A and D content of these fish oils, nor between oil content of the livers and vitamin value of the oils.

Food and Drugs

An abstract of Reports of Public Analysts for the year 1938 in connection with the sale of food and drugs has recently been published by the Ministry of Health.

Out of 150,567 samples of food and drugs reported on by Public Analysts there were 430 contraventions of the Public Health (Preservatives, etc., in Food) Regulations, of which no fewer than 216 related to sausages. Most of the adverse reports on these were due to failure to observe the requirements of the Regulations concerning the permissible quantity of sulphur dioxide added.

Other samples reported as contravening the Regulations included table jellies containing benzoic acid, and barley, pickles and potted and other meats containing sulphur dioxide. Samples containing preservatives in excess of the amount permitted by the Regulations included jam, dried fruits, beer, non-alcoholic wines and fruit juices. Boron preservatives were found in samples of cream, butter, sausages, one sample of milk and one of fresh meat.

A few samples of butter consisted partly, and one wholly, of margarine, which surely indicated a certain amount of optimism by the would-be contravener of the Regulations.

An unspecified number of samples of potted meat were reported against owing to the presence of a proportion of starchy matter, and some contained excessive quantities of water. An appreciable number of samples of canned fish and other canned foods contained tin and lead, and two samples of canned tomato pulp contained copper, tin and zinc. A curious case was reported of a sample of cocoa containing 6·75 per cent. of Epsom salts, and it seems a pity that the producer did not turn his product into a modern "health food," thereby probably being able to sell it at a much higher price.

Taking into consideration the enormous amount of food that is consumed during the year and the innate wickedness of human nature, the report is remarkably encouraging to the consumer.

Watered Milk

In our January issue this year we referred to the weak, vacillating policy of the Government in allowing themselves to be stampeded into a postponement of the Milk Bill under pressure by vested interests. As our readers are aware, that Bill embodied a long-term policy for the production and distribution of milk based on the famous White Paper.

The Bill was finally withdrawn in February and it was stated that a new Bill would be framed to replace it. Commenting on this in our May issue we said that we had no indication of the forms the new Bill would take . . . but the pasteurisation proposals would be dropped. We also said, "If the Government ignore this expert medical opinion it will be unpardonable". This, however, is precisely what has happened in the new Bill introduced in July. It has avoided controversy by omitting all the important provisions. It no longer provides for a milk commission to keep the industry under review and to give advice when needed. With this goes the power to spend money on research; the regulation of imported milk and products has disappeared; there is no longer the power to make pasteurisation orders and to prevent the sale of unpasteurised milk; and finally, nothing is done to reduce the cost of distribution.

All that is left is extra payment for what is termed quality milk, the authorisation of cheap milk for schools and nursing mothers and a grant for milk used in manufacturing butter and cheese. The Bill leaves unsatisfied the unanimous claim of the leaders of the medical profession and is contrary to the policy of the Ministry of Health that the milk supply should be made safer. Expert

opinion has been sought and then flouted in an inexcusable fashion. What might have been a useful measure and which must ultimately have been of benefit to the nation's health and the consumer's pocket has been mutilated until a shadow of its former self has been foisted upon us. The Government deserve no stripes for this effort.

White and Brown Sugar

That there is quite an appreciable amount of ignorance as to the exact nature of sugar has been exemplified by an article by Sydney W. Cole in a recent issue of the *British Medical Journal*. He sent out a questionary to nearly 4,000 men and women who are on the Medical Register and who are characterised as having some Cambridge degree, his object being to obtain information as to the conditions under which they prescribed glucose by the mouth and also as to their opinion of the effect of a comparable dose of cane sugar in the same circumstances. He was rightly struck by the comments of a number of his correspondents on the variety of table sugars they recommended. Some specified "cane" sugar as distinct from "beet" sugar, others desired information as to the nature of the substances present in "brown" sugar, which they imagined were of dietetic importance and which are removed when the sugar has been refined; others distrusted what they termed "synthetic" sugar. We are wondering what exactly was meant by synthetic sugar, as it was evidently some form of sugar on the market and not "from the air."

Dr. Cole proceeds to remove what he terms certain misconceptions, and has written a popular article on the subject which certainly should be read, marked, learned and inwardly digested by those ladies and gentlemen on the Medical Register who prescribe cane to the detriment of beet sugar. The "Naturopaths" (not on the Medical Register) who pin their faith to certain mysterious virtues in brown sugar, rock salt, etc., may also well be interested in the description of the contents of raw sugars other than sucrose and invert sugar. These substances may consist of sulphites, sand and clay, pieces of cane fibre, swarms of microbe organisms and live sugar lice.

The writer thought it important to state positively that brown sugars do not contain any vitamins or other valuable accessory food factors that are removed in the process of refinement, which converts the crude material into a pure sterile compound of uniform composition.

The Importance of Beans

A Peruvian antiquary, Señor Rafael Hoyle, has evolved a theory that beans must have meant something in the ancient American civilisation. To-day they mean either a cheap lunch or something in a can. Señor Hoyle has studied the designs on numerous vases of the former South American Indians. One of the designs is reproduced in *Science News Letter* as a sort of frieze across the top of a page; it shows men gracefully striding over inequalities in the ground, and holding an arm stretched out in front. In each outstretched hand is a small object. Señor Hoyle thinks that the object is a bag, and that there are beans in the bag; moreover, the beans are scratched or written on with what is apparently a series of tallies or records. He was led to this last conclusion by finding what are apparently representations of single inscribed beans on other vases, and on each bean are dots, bands and pictograms. His theory will probably not go unchallenged, but it seems reasonable in view of old associations with another kind of beans' talk; and it is an awful thought that one question to which the answer seems so obvious nowadays may have descended to us from the times when counting up to five was rather a feat, not easily performed without the aid of some simple and readily accessible kind of counter to make the abstract concrete and tangible.

Food and the Soul

As a variant to Danzig the news posters recently displayed "R.A.F. officer accused of hitting cook". We did not acquire the paper to make further investigations, but the naughty action was doubtless connected in some way with food. Whether it will seriously imperil the delinquent's immortal soul is a matter for the theologians to decide. The opinion of an American Methodist weekly, *Zion's Herald*, may bear upon this. "Startling indeed would be the list of souls which, in the history of the world, have been damned by bad food."

Not only this, but the Churches are waging an all-but-losing fight with restaurants for the souls of men who are leaving home and the Church because of half-cooked food, greasy food, soggy pies and doctored puddings.

We are naturally thoroughly convinced of the importance of food, but the moral or theological aspect has hitherto escaped our notice. Records, we believe, show that few suicides are committed after a good dinner, and, if truth were known, a well-dined murderer must be a *rara avis*.

REFRIGERATION IN THE BAKERY

A practical article for bakers, by JAS. STEWART, Confectionery Teacher at The National Bakery School

ONLY a few years ago the average baker did not consider refrigeration very important, but nowadays most enlightened bakers, confectioners and caterers realise that they must have a refrigerator or cold storage chamber as part of their essential equipment in order to make the best use of their raw materials and to keep their consumable products in perfect condition prior to selling them.

There are, however, many tradesmen who refrain from installing a refrigerator in their businesses, because they are not fully aware of the value and uses of such equipment. Many do not realise, because they have not studied the point sufficiently, that a cold storage chamber is a necessary part of the bakery equipment which will show useful dividends.

Advantages of Refrigeration

Let us consider the main advantages of a refrigeration system in the modern bakery. They are as follows:

1. The total elimination of waste of raw materials such as yeast, cream, milk, eggs, fats, etc.
2. The cooling of doughs and pastes in process of manufacture.
3. The prevention of staling of the manufactured foodstuffs.
4. Better service and satisfaction given to the consumer.
5. The larger profits which can be made.

Let us now consider these advantages in detail.

Elimination of Waste of Raw Materials

YEAST STORAGE. Compressed yeast has its longest life when stored between the temperatures of 37° and 40° F. The refrigerator is therefore an ideal yeast store when running within these limits.

CREAM. Most confectioners use fresh or emulsified cream. Fresh cream must be kept at about 40° F. to prevent it from going sour. Emulsified cream should be stored at least 12 hours after manufacture in a cold chamber about 40° F. in order to mature it and keep it in good condition until required for use. Butter cream and creamy fillings, which are used in most bakeries, must also be stored in a cold chamber, especially during summer time, in order to be able to use them successfully and prevent them from going soft or even rancid.

MILK. Any milk left over may be stored and used next day.

EGGS. All confectioners use eggs in one or other of the forms in which they are supplied to the trade, but the majority use frozen eggs. These may be generally delivered several times a week to meet the daily requirements, according to the size of the establishment. This involves additional delivery charges, increased book-keeping, multiplicity of accounts and, because of relatively small deliveries, a higher price for the eggs. Where a refrigeration chamber is available, supplies for a week or more can be stored. Larger consignments of eggs eliminate costly delivery charges. The eggs can be stored in a chamber just slightly over freezing point, so that they

Air-conditioning plant in a bakery.

(Courtesy Frigidaire, Ltd.)

will thaw out so slowly that an almost perfect emulsion of eggs is ready when the cans are opened. There is the added advantage in that there is always a reserve stock of eggs at hand if they are urgently required to fulfil orders. Eggs that are slowly de-frosted in a cool chamber give better results and increased volume in the cakes compared to those that have been hurriedly de-frosted. When any portion of the opened can of eggs is left over at the end of the day, it can always be returned to the refrigerator, where it will keep in good condition until the following day. The saving on eggs alone would soon pay for the cost of the refrigerator.

FATS. Butter will keep for a considerable time in a perfectly sweet and good condition when stored at a low temperature. It is cheaper to buy it in large quantities than in small. Butter must also be kept cool and firm when it is used in making Danish pastries or puff pastries. Margarines are also cheaper to buy in large quantities, and although they do not go rancid so readily as butter, they tend to go too soft and oily in summer weather unless stored in the refrigerator.

The Cooling of Doughs and Pastes

Puff pastry made from butter or pastry margarine requires much manipulation and cool storage before use. If it is placed in the cold chamber between the various turns and after it is prepared, it will give bigger and better pastries than that prepared in the ordinary manner without access to a cold room. It is not absolutely necessary to make up puff paste every day when there is a cold chamber available in which to store it.

SHORT PASTE. During a hot summer day many pastrycooks have a difficulty in making good short pastry owing to the fats being too soft. By storing the fats in a refrigerator and by leaving the paste in it for a time after making, there will be no risk of it being too short and difficult to cut out. The paste can be cut out and tinned up a day before it is required and stored in the cold chamber ready for baking the next day if necessary.

DANISH PASTRY AND FERMENTED DOUGHS. Dough refrigeration development has enabled confectioners to coordinate their production more closely with sales, making it possible to sell better and fresher confectionery. It is now possible to prepare these fermented pastries and fermented buns, and after giving the usual fermentation periods and turns, to mould the products. After panning they are egg washed and can be stored in the refrigerator for at least a day before proofing and baking. The pastries and buns are quite satisfactory after 24 hours' refrigeration. Doughs in bulk must be covered over with a damp cloth to prevent skinning.

Prevention of Staling

Most confectioners make buttercream fancies and gateaux. When the cake portion of these has been made, it has to cool for a day before it can be cut up into the required shapes. Cakes will cool quicker if placed in the cold chamber and will not dry out so much there as in the bakery; also a light sponge gateau will not cut crumbly when thoroughly cold, and thus there will be less waste. It is only necessary to make up Genoese once or twice a week when there is a cold chamber in which to store it, as there is no fear of it staling.

Confectioner's Cabinet for storing cakes and small cream goods.

(Courtesy J. and E. Hall, Ltd.)

When fancies and gateaux have been decorated with creamy decorations, they should be placed in the refrigerator to set the filling and decorations, so that when displayed for sale they will be easy to handle without spoiling the decorations. When they are sold to the consumers they will be easy to pack in the boxes without spoiling the decorations.

When these goods are unsold in the evening or at the weekend they get shop soiled and are inclined to lose their freshness; but if they can be returned to a cold room they will retain their bright appetising appearance and will not stale so rapidly. Not only decorated fancies and gateaux but other types of cakes are liable to remain unsold at weekends, but if they are of good quality and are stored in the refrigerator they will retain their freshness and be quite fit for sale the following week.

MINCEMEAT AND FRUIT CAKES. Most confectioners during the forthcoming months will be considering their preparations for the Christmas trade. For those who make their own mincemeat, the fear of fermentation will not worry those who have a cold chamber available. Christmas cakes are generally better if they have been matured for a few weeks before decorating them. This maturation is best carried out at the low temperature afforded by the cold chamber, and if the cakes are of good quality they can be kept for months and progressively improve in eating qualities.

Better Service

The best possible service is the aim of every progressive and ambitious baker and confectioner, and if he has at his disposal the necessary refrigerating facilities, on the sudden onset of a spell of hot weather, his cream goods are not sour, his pie jelly is set properly and the meat in his patties and pies is irreproachably fresh—details which do not escape the criterion of the watchful and judicious shopper.

There are display counters available at the present time fitted with refrigerating apparatus. These are almost indispensable for the display of all types of readily perishable goods such as pork and veal-and-ham pies, cooked ham, beef and tongue, ready-prepared sandwiches, cream pastries, etc.

Freshness is the one dominant factor in merchandising perishable goods, and if the installation of a refrigerator did nothing else than shorten the time between the making and consumption of the goods, that single phase would reward the bakery for its investment, as it would help to increase consumption of the goods. One can use the fact of having a refrigerator on the premises as an advertisement for the products. A ticket can be shown stating that during hot weather all cream cakes and meat products are kept cold and fresh by the refrigerator.

When a cold chamber is available and also a refrigerator display cabinet, larger stocks of more appetising products can be kept, and thus one can always guarantee to give the consumers that satisfaction of having good quality products ready for use which enables one to give better service than the competitor who has not this necessary equipment.

Lower Expenses and Larger Profits. As has already been pointed out, it is possible to buy raw materials cheaper in large than in small quantities, therefore if there is a cold storage one can at once reduce the expenses and raise the profits by buying in larger quantities and not so often.

By installing a refrigerating system there will be no waste of raw materials or of any staling of the finished cakes and pastries, therefore the losses are cut at both ends and the refrigerator soon pays large dividends.

When a refrigerating display cabinet is available for displaying finished goods, the shop assistants will be saved much time by having the goods ready at hand for sale when the customers require them.

It is high time that all bakers and confectioners realised that a refrigerating plant is just as necessary a part of the bakery equipment as the oven. Those who have this plant will fully endorse this view.

Air-Conditioning

Some modern bakeries, both in this country and America, are completely equipped with air-conditioning equipment, where the air is not merely filtered and cleaned to eliminate dust, etc., but the constant control of temperature and humidity enables unvarying perfection in output to be maintained all the year round and gives comfortable working conditions for the operatives. The time will come when all factories of any size will consider this air-conditioning as a paying proposition.

RESEARCH WILL BE THE MAIN THEME AT
1939 AMERICAN BAKERS CONVENTION

"Progress through Research" will be the theme of the 1939 American Bakers Association Convention and Annual Bakers Meeting in New York City, October 15-19, according to an announcement made on July 18 by Tom Smith, Secretary of the American Bakers Association.

"Research" in the broad sense of scientific and well-planned production, merchandising, distribution and management, based on known facts and proven methods, will keynote the entire convention programme according to Secretary Smith, who said: "Plans for this year's important national convention of bakers call for a programme of addresses and discussion meetings, emphasising the need for absolute abandonment of slip-shod, rule-of-thumb practices and pointing the way for more widespread adoption in the baking industry of effective and efficient methods and practices.

"The day of the 'blooper' in the bakeshop is gone. He has been replaced by the bakery engineer. The production man has learned much in recent years, and is learning more rapidly as time goes on about quality and economy. Even greater opportunity for improvement presents itself in merchandising, distribution and management, all three of which have been even more afflicted with 'blooping' than production itself.

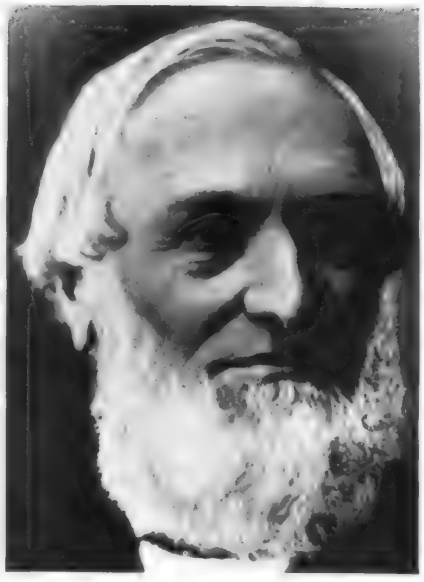
"One of the most fundamental, and one of the most neglected, functions of business is research—which is nothing more than the well-planned obtaining of the essential facts on which our operations should be based.

"Too many of us in business have been prone to regard 'research' only as something carried on by a technician in a secluded laboratory—something bearing little direct and practical relation to our day-to-day operations. We have failed to recognise the vital necessity of factual research as an indispensable foundation for every aspect of the business. We have to a certain extent developed, sold and distributed our products according to what we think or assume to be the facts as to what consumers in our market want, as to what production, selling and delivery methods are best and most economical. We have done little along lines of any real and sustained effort to determine whether the facts are what we assume them to be.

"The research which has been carried on has developed some surprising and useful information, and has indicated the importance of such research as a permanent business function.

"The Convention in New York City will bring out significant information and ideas concerning the kind of scientific management which is the new order in business and to which the baking industry as a whole must turn if we are to keep and improve our place in the sun."

The importance of research to all business was recognised recently at the Food Technology Conference in Cambridge, Mass., sponsored by the Massachusetts Institute of Technology together with the American Institute of Baking and other organisations, where Clarence Francis, President of General Foods Corporation, said that scientific research "on a magnificent scale" was a means to increasing the national income to 80 or 100 billions of dollars a year.



The Founder.
Jonathan Dodgson Carr.

CARR'S of CARLISLE

This flourishing biscuit-making factory covers some ten acres of land and gives work to approximately 2,400 people in Carlisle, apart from sales, delivery and dépôt staffs. It is here described by T. CROSBIE-WALSH, *F.I.C.*

THE IMPOSING biscuit factory at Carlisle had its beginning in 1831, when Jonathan Dodgson Carr, the son of a Kendal grocer, set up in business as a miller and baker.

In the early days of the nineteenth century the use of machinery for the manufacture of biscuits (other than ship's biscuits used by the Navy) was unknown, their preparation being carried out entirely by hand.

Carr's First Machine

J. D. Carr devised a machine, constructed on the lines of a printing press, for cutting and stamping biscuits which quickly led to the manufacture of biscuits in quantity and incidentally established the biscuit trade in Great Britain. This original machine now stands modestly by the side of the thundering giant which is its latest successor.

Mr. Carr's invention was very successful, and in 1841 he was appointed by special warrant biscuit baker to Queen Victoria. Up to the time when he received this signal honour he was the sole maker in this country of machine-made fancy biscuits. Since then Carr and Co. have kept pace with all developments, and to-day it is one of their proud claims that there is no better-equipped biscuit factory in the world.

Mr. J. D. Carr died in 1894. His business was carried on by his four sons, one of whom subsequently abandoned the biscuit business. In February, 1894, the business was made into a private limited company with Henry Carr as the first chairman, and in 1927 it entered the ranks of public limited companies with Theodore Carr as chairman.

At the present time the chairman of the company is Ronald N. Carr, a grandson of the founder, and two great-grandsons serve on the board of directors. Truly a great example of continuity of family control which still manifests itself in the preservation of the old goodwill and understanding between masters and workers which has characterised the concern through the years.

In addition to the royal warrant granted by Queen Victoria, the firm have also been recipients of warrants conferred by King Edward VII and King George V, while numerous awards have been gained from time to time.

The Factory

The factory at present covers some ten acres of ground and gives work to approximately 2,400 people in Carlisle. This figure does not include the vast sales staff and the delivery and depôt staffs.

In addition to the biscuit plant, the works include efficient plant for the manufacture of chocolates and chocolate-coated biscuits. The firm have specialised in the production of the latter and pride themselves on the installation of the most up-to-date manufacturing and covering plant.

The works incorporate a large printing department, a cardboard box factory and a tin-making plant.

The commercial offices of the firm were modernised some years ago, and in 1930 the staff took over an entirely new block of modern office buildings.

Ingredients of Biscuits

First of all comes the flour used in the biscuit making. Decades of experience of selection of varieties and their proper cultivation have enabled the flour miller to supply the biscuit maker with precisely the quality required for each particular type of biscuit. Certain districts and mills excel in the production of those soft velvety flours,

Jonathan Dodgson Carr set up business in 1831 as a miller and baker.

grown in this country, which are an important factor in the manufacture of creamy-textured English biscuits.

In addition to the careful selection of appropriate varieties, other things such as storage, dressing and blending as well as experienced handling contribute to the perfection of the finished product. Flours for crackers, wafers, shortbread and cakes all call for the most exacting choice.

Sugar, Eggs and Milk

Pulverised and air-separated by up-to-date machinery are the British-refined cane sugars used, while syrups, malts and special sugars are chosen for their characteristic flavours and qualities.

Large numbers of fresh eggs are used, which are broken and separated in a novel hand separator and refrigerated in a modern plant attached to the central refrigerator system.

Fresh milk is obtained locally and condensed and powdered milk from the foremost English dairies.

The giant biscuit stamper.

Another dairy product is first-grade cheese, which is ripened on the premises in special rooms.

Fruits and Nuts

Fruits are machine-washed, dried and passed over an examining belt, a portion of which is fitted with bottom illumination.

Nuts are blanched, dried and roasted, coconut and ginger dressed, and baking powders blended.

Among other adjuncts are special jams and jellies for biscuit centres and "toppings".

The Bakehouse

The flour is gravity-fed from the warehouse to bakehouse dough bins. Suitable fast-moving hoist-conveyors under cover draw goods from wagons into the warehouse, and a continuous sack conveyor belt links up the main flour store with all sections of the factory at the points where it is required.

Automatic Five-Tier Oven

One of the outstanding machines in the factory is T. and T. Vicars' complete automatic biscuit-making plant, which has been running since 1933 and is one of the largest production units in this country.

The dough directly from the mixer is placed in the hopper of a sheeting machine. This reduces the dough to a uniform smooth sheet and feeds it directly into a double-roller cutting and embossing machine.

Cutting Machine

On the cutting machine two pairs of rollers reduce the sheet down to biscuit thickness, and this sheet passes

continuously under a reciprocating cutting head so that there shall be no pause in the movement of the dough; the cutters and embossers move with the dough whilst operating. After passing the cutters the scrap dough around the biscuits is automatically lifted away and conveyed back to the sheeter. The unbaked cut-out biscuits, still without a pause, are automatically delivered on to pans which are travelling underneath the delivery end of the machine.

There is necessarily a short space between each pan, but without altering the velocity of the biscuits in any way the pans are completely filled and no biscuits dropped in between.

The oven is of the conveyor type, the biscuits on pans being carried by cradles; the cradles are attached either side to endless chains. The cradles with the pans of biscuits enter in at the top of the oven, travel full length, then the cradles, whilst still maintaining their horizontal position, are lowered down and travel back underneath the first run. This travel backwards and forwards is done five times before the biscuits reach their lowest level and pass out of the oven at the delivery end. By this method a very long travel can be obtained in a relatively small space. Actually there are about 140 pans of biscuits in the oven at one time.

Almost as big a problem as baking biscuits is the cooling of them, as it requires a longer time to cool than to bake, particularly for high-quality and well-conditioned biscuits.

In this plant of Messrs. Carr the trays of biscuits at the delivery end of the oven are automatically lifted out of the cradles and placed in the cradles of a cooler. The cooling conveyor takes the trays of baked biscuits up to the ceiling of the floor above the oven, and they travel backwards and forwards for a time, half as long again as the baking time, before the biscuits are removed from the trays and put on to a packing conveyor.

Wafer Baking and Sandwiching

This is an important department with a large out-turn. Specially selected flours, milk, butter, eggs and sugar are made into a batter in the mixing machines. The liquid constituents are measured automatically by an appropriate machine.

The wafers are cooked on a number of the latest type 18-plate gas-fired wafer machines working at high speed. The batter is fed from a tank to the plates and its smooth distribution over them is an attractive sight.

The Baked Sheets

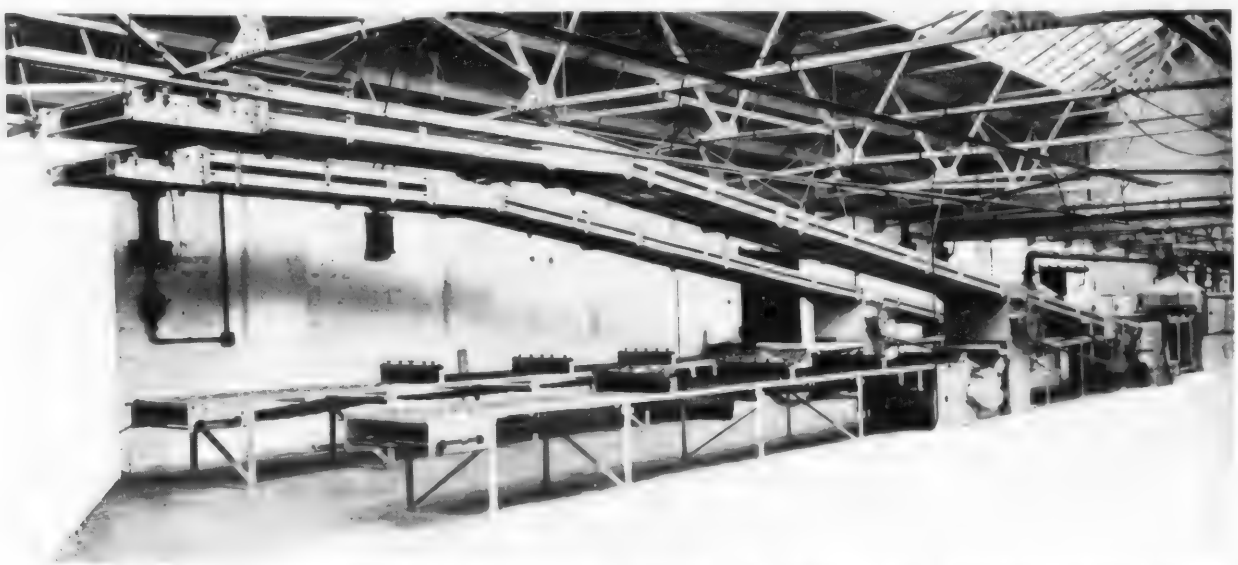
The baked sheets are readily removed from the plates; in fact, they practically fall off. Ragged edges are removed, after which the wafers are stacked for immediate saw cutting in light trays. After being cut, the now completed wafers are mechanically conveyed to the sorting and packing department.

Apart from the plain wafers are those filled with cream variously flavoured with chocolate, vanilla or fruit. The cream is spread by machine in a variety of thicknesses between two sheets, after which they are cut by high-speed machines to the required size, emerging from the cutters on to travelling belts which convey them to the packing room.

Cream-Filling Preparation

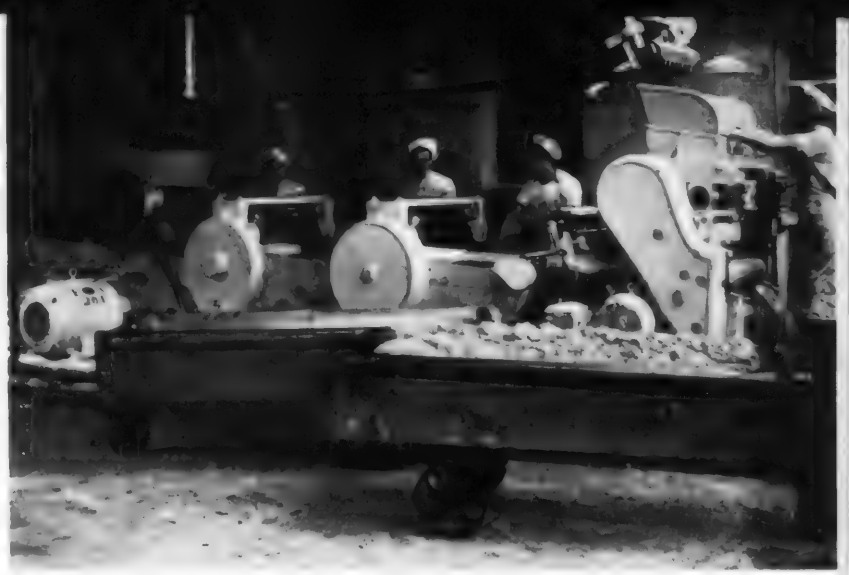
The fillings for the wafers are prepared in a department installed with a battery of beaters, whisks and pans. A large number of attractive-looking fillings such as meringue, hard icings, marshmallow toppings and biscuit creams are made here and caramel and jam centres brought to working condition.

Biscuit creams, marshmallows and icings are produced on a series of sandwiching machines and are



At the end of the oven the biscuits are automatically stripped off the band and passed to a special cooling conveyor system which is arranged overhead so as to economise floor space.

(Courtesy Baker Perkins, Ltd.)



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(T. and T. Vicars, Ltd.)

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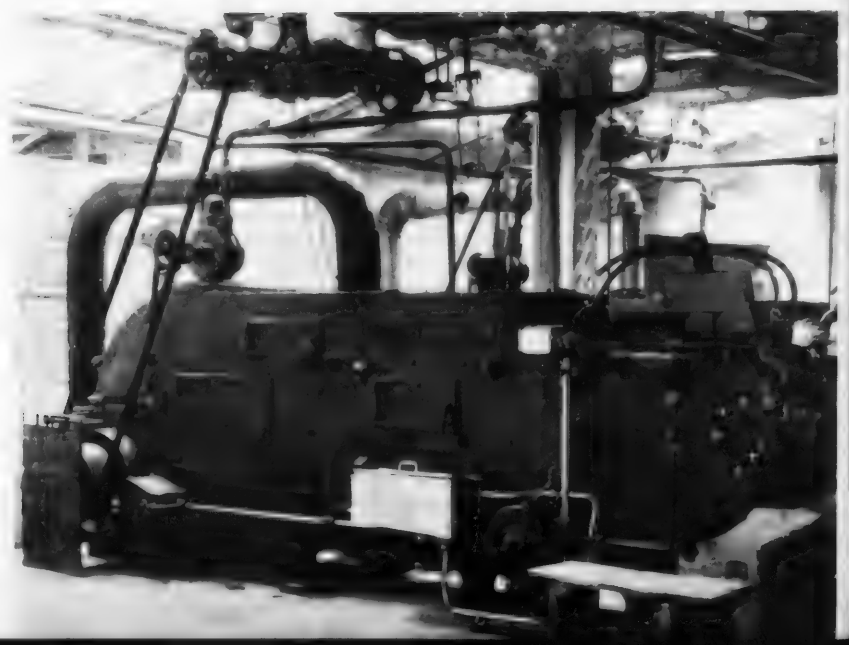


This is an 18-plate ice or sandwich wafer baking machine.

(Baker Perkins, Ltd.)

applied by hand stencilling, piping and dipping. It is of interest to record that the sandwiching machines were designed by one of the late chairmen and turn out huge quantities of creams of several flavours at the same time.

This department is provided with suitable cooling arrangements, and movement of the products is effected exclusively by travelling conveyors.

Chocolate Manufacture

The chocolate used for biscuits and confectionery is prepared in a special department of the factory.

Selected beans are dressed and graded and passed as required to batch gas roasters. After individual roasting and cooling the batches are fed to crusher, minnower and de-germer by which is obtained a particularly clean nib, which when blended and passed through the liquor mill makes a smooth product eminently suitable for subsequent flavour development.

Melangeur-mixed pastes of liquor, finely pulverised sugar, milk and milk products are fed to several fine roll refiners with separate motor drive, each delivering over 2 tons of first-grade refined powder per day, equal to 50 tons of chocolate per week. The refiners are particle-size controlled, by which perfectly uniform grinding is achieved, the refined mass falling evenly into large tipping bogies for storing, plasticising and conching.

The plasticised powder from the refiners is conched for one to three days in longitudinal and "sylconche" conchers thermostatically controlled. After storage the finished chocolate is ready for use in the numerous enrobing, moulding, dipping and depositing machines.

Enrobers

Enrobers, having a high capacity of finished biscuits and wafers, are installed, in addition to which are several smaller enrobers and hand dippers, each with its cooler.

An interesting installation is the Jensen moulding plant in line with wrapping and banding machines and fitted with a vacuum tail pick-up.

The lay-out in this department, with its conveyors, return heaters for moulds, lifts and other labour-saving devices, gives a vivid impression of efficiency.

All refrigeration is served by a central Sterne plant and exit ends of coolers ventilated with chilled air.

Machinery cannot always be used. Here is a case where oat cakes are cut by hand. They are a very popular Carr product.

Messrs. Carr have recently incorporated an ingenious suction apparatus for picking up the biscuits from the trays and passing them through to a stacking machine, so that the hand labour is reduced to the absolute minimum.

Chocolate Confectionery

Chocolate creams are made in variety, as also attractive puffed ice confections and fondant goods.

The sugar for confectionery is pulverised in Mikro mills at the rate of ½ ton per hour, and the shredding of cocoa block by a useful high-duty cutter.

Packing and assorting is assisted by conveyors and also machine and hand labelling. Square tins are expeditiously covered with machine-pasted labels and dried at low heat, and all goods are kept at controlled low-storage temperature.

Cream Cracker Biscuits

A 32-inch Automatic Wire Band Plant by Baker Perkins has recently been installed in the factory. The plant is intended for the manufacture on a large scale of biscuits of the cream cracker type, and is fed by a 32-inch wide two-gauge roll Baker Green High Speed Patent Continuous Cutting Machine of the latest type. This delivers the biscuits direct on the wire mesh band of a gas-fired travelling oven which is 180 feet long.

At the end of the oven the biscuits are automatically stripped off the band and passed to a special cooling conveyor system which is arranged overhead in order to economise floor space.

After cooling, the biscuits are automatically delivered into a patent biscuit stacking machine, which rows them up and places them in vertical rows on the packing table in such a way that they are carried forward in front of the packers, who pick up the exact number of biscuits required to fill one row of a tin or carton.

Passover Goods

"Motzas"—the Passover cakes of the Jews—and kosher biscuits are also made. Motzas are of the ordinary kind and also egg motzas. Biscuits are made into sheets about 10 inches by 9 inches, and a special Motza biscuit is reduced to meal form and packeted for pudding making, etc., by the Jewish fraternity.

Cake Bakehouse

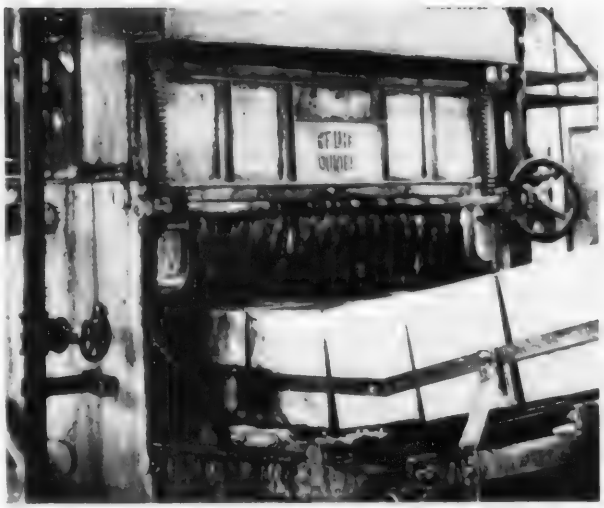
Large quantities of slab and other cakes, gingerbread, shortbread, breakfast biscuits, rusks and other articles are prepared in a special bakehouse.

Apart from the two large automatic ovens already described, there are a number of draw-plate coke-fired ovens in constant service.

Tin Washing

An interesting feature is the Kellie Washer, the capacity of which has been brought up to 14,000 square biscuit tins per day. Much research work in the laboratory of the company resulted in the discovery of a specially efficient detergent, by which maximum capacity of the washer has been obtained.

A small proportion of the tins are returned in such bad condition that they cannot be straightened by the heavy machines installed for this purpose, and these are scrapped and baled by appropriate machines. Despite the large capacity of the washing machine little labour is used, as the operations are carried out automatically and conveyors conduct a constant stream of clean, dry tins to the packing section.



". . . An interesting feature is the Kellie Washer, the capacity of which has been brought up to 14,000 square biscuit tins per day."

The Boiler-house

Steam is supplied by three Babcock water tube boilers, fitted with automatic stokers, water softener and heaters and superheaters.

Electric power is supplied by the local power station and converted at suitable points.

Coal gas is the principal baking fuel used, although coal firing with automatic stokers is sometimes preferred for some of the products.

Great attention is paid to fuel economy by means of gas analysis, steam meters and other well-known adjuncts to the boiler-house.

The new Sterne ammonia refrigeration plant is admirably housed adjacent to the cold stores and serves the whole factory and incidentally is attached to an ice-making plant.

Quality Control

The purity, suitability and commercial value of ingredients, packing and other materials of all kinds are controlled by qualified chemists, who also work on product development and choice of new products, flours, flavours, wrapping materials, etc.

Welfare Work

Carr and Co. may well lay claim to being among the pioneers of industrial welfare work. As far back as the forties, Mr. Jonathan Dodgson Carr instituted a library and evening schools for his employees, who were also invited to an annual excursion, an amenity rare in those days. The work thus early begun has developed on sound lines and, in accordance with the modern trend of

thought, the Welfare Department is recognised as an integral part of the management, charged with the maintenance of the company's employees and regarding each as an individual having a personality of his own and not merely a factory hand.

The firm was among the first to institute the five-day week, and has for many years granted holidays with full pay to its employees.

The direction of all spare-time activities is in the hands of the workers themselves through the elected Advisory Committee, which plays an important part in maintaining happy relations between the management and the employees. The promotion of Savings Banks, Benevolent, Hospital and Convalescent Funds is a feature to which increasing importance is attached, some thousands of pounds being contributed annually. Another interesting feature is the works magazine, "The Topper Off", which is contributed to by the employees and contains, among other things, news of their various social and sporting activities.

SOME SUPPLIERS TO CARR'S OF CARLISLE

Travelling Gas Oven: *T. and T. Vicars, Ltd., Earlestown.*
Coolers: *Baker Perkins, Ltd., Peterborough.*
Pick-up Letters: *Lamson Pneumatic Tube Co., Ltd., London.*
Mixers: *Melvin and Gillespie, Ltd., Glasgow.*
Mixers: *T. and T. Vicars, Ltd.*
Coke Ovens: *Baker Perkins, Ltd.*
Automatic Wrapping Machines: *Forgrove Machinery Co.* (*Agents: Baker Perkins, Ltd.*).
Labelling Machine: *Rose Bros.* (*Gainsborough*), *Ltd., Gainsborough.*
Enrober: *Baker Perkins, Ltd.*
Heating and Ventilating: *C. A. Dunham and Co., Ltd.*
Tin Washing: *Robert Kellie and Son, Ltd., Dundee.*
Wrapping Machines: *Bramigk and Co., Ltd.*
Jensen Moulding Plant (*Agents: Baker Perkins, Ltd.*).
Cardboard Cutter: *Chambon, Ltd.*
Carton-making Machines: *Rose Bros.* (*Gainsborough*), *Ltd.*
Four-colour Label Printers: *Chambon, Ltd.*
Conche: *J. M. Lehmann* (*Agents: Bramigk and Co.*).
Transport Contractors: *Keith and Boyle* (*London*), *Ltd.*
Transport Contractors: *Garlick, Burrell and Edwards, Ltd.*

SPHERE FORMING MACHINERY FOR CONFECTIONERY

An interesting fully automatic machine for the formation of spheres or egg shapes, for use in confectionery plants, has been devised by a German firm. It requires only the service of one operator, who watches the machine and fills the mix used into a hopper, and is capable of a production of up to 25 cwt. per 8-hour day.

The operating parts of the machine are mounted on a neat case which serves as a base and encloses the gearing and drive. At one end of this case is a small hopper, into which the mix to be used is filled by hand. Any type of mix from quite soft to very stiff can be used without difficulty.

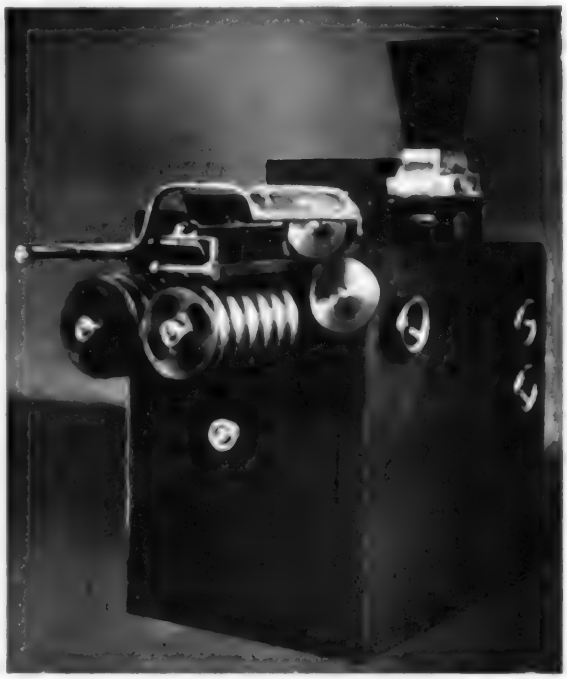
At the bottom of the hopper are two rolls between which the mix is caught and by which it is pressed down into a compression chamber. This is a sort of pump, in which a piston, considerably smaller than the chamber, moves backwards and forwards to press the mass out of a calibrated hole at one end of the chamber.

Directly in front of this hole, from which the mass issues in a roll, is a small transport belt. The roll of mass falls on to this, and is carried along towards the other end of the case forming the machine base. Above the transporter is a cutting device which falls down on to the mass at a regular cadence and cuts the roll into a series of short pieces. The spacing of the knives of the cutter can be regulated so as to produce pieces of varying volume, and hence spheres of different diameter as desired. As these pieces are carried along by the belt, they reach the end, above which a wide revolving paddle is arranged. As this turns, it pushes the pieces of roll off the belt to one side, where they fall down directly between forming rollers. The width of the revolving paddle being the same as that of the forming rollers, the pieces are pushed off in groups exactly sufficient in number to fill the roller. The actual number depends on the size of the spheres to be obtained, more small pieces being pushed off at a time than large ones.

The forming rolls are two large steel rolls in which a series of semi-circular or semi-oval grooves is cut. The size of these grooves determines the size of the finished sphere or ovoid. The rollers have only a very slight play between them, the drive of each being provided by gearing inside the case, and calculated so that one roll will revolve slightly faster than the other.

As the pieces of mass fall on to these rolls, one piece will be engaged in each groove. The different speeds of revolution of the two rollers cause the mass to rotate between them and yet be pushed down. In the course of its rotation between the rollers, it is pressed into a sphere, falling through between the two rolls when its formation is completed. Here a transporter belt (not forming part of the machine) has to be provided to catch them and carry them on to the next process.

The machine is driven by a three-quarter horse-power motor, and the weight of the whole assembly is about 880 lbs. Mounted on rollers if desired, it can be moved about a plant with great ease, the motor being connected to any convenient wall plug.



T. H. Fairbrother, M.Sc., F.I.C., REVIEWS THE

MILLING AND BAKING INDUSTRIES

The Author discusses, among other things, price fluctuations, the new Wheat Act, flour treatment, storage and research.

THE MOST outstanding feature in the last twelve months affecting the milling industry has been the phenomenal fall in the price of wheat. The remarkable feature is that there has been no spectacular fall—no wild panics or corners or fortunes made—just a steady decline in prices for months.

Statistics show that in August last year No. 1 Manitobas, ex ship, London were worth 38s. 6d. per 496 lb. In June this year they were only 27s. 6d. A similar drop occurred in the case of Australians from 34s. to 24s. English wheat has been as low as 17s. 6d. per 504 lb. Naturally with this fall in wheat prices there has been a corresponding drop in flour prices, and the price of standard grade flour has dropped from 32s. per sack of 280 lb. in June last year to 21s. in July this year. Obviously with the fall in the value of wheat there has been a corresponding rise in the quota payments to compensate English farmers for the poor prices realised for English wheat, and the quota rose from 2s. per sack in July last year to 6s. 6d., at which high level it remained until June 18 this year, when for no apparent reason at all it was reduced to 5s. 6d. With the present low prices it is quite likely that the quota will be increased again.

The Reaction

The immediate effect of the low prices is, of course, felt by those countries which are dependent on wheat as a staple export, but it is bound to have a boomerang effect upon those countries which sell manufactured goods to the wheat-producing countries.

It will be remembered that in 1931 when the price of wheat fell to a level comparable with to-day's value the loss of purchasing power among the primary producing countries was the beginning of that disastrous depression which drove us off the gold standard, the pernicious effects of which still persist.

The situation to-day is, however, rather different from what it was eight years ago, and in many countries the burden of low prices is not left entirely on the shoulders of the farmers but is spread about in the form of quotas. Still the Governments of the wheat-exporting countries have cause for apprehension and they are casting about for remedies. In January, a committee representing the chief exporting countries was appointed by the International Wheat Advisory Committee to prepare a scheme which might be submitted to a world wheat conference. So far, however, no agreement has been reached. One remembers how similar attempts failed completely in 1934. It does not look as if there is any prospect of a speedy recovery unless drastic action is taken to restrict production and to stabilise prices. That action was tried before and failed. Is it likely to succeed now?

In 1934 a bumper crop in Argentina coupled with large harvests in Europe caused the break up of the agreement previously reached and, in the writer's view, attempts to fix minimum prices and to restrict supplies will always be abortive.

It is difficult to interfere with nature and with the laws of supply and demand. The world conference completely failed to achieve its object, but within two years poor crops over the greater part of the world sent prices soaring again. This, coupled with an increasing demand in China, raised hopes of a permanent improvement which Japan's invasion of China has stopped.

Restriction of production is, as Mr. Bruce said at the World Economic Conference, a terrible policy to accept and one which implies an attitude of intolerable pessimism. But what is the alternative? If we could bridge the gap between production and consumption by creating an effective demand among the many millions of people in the world who would gladly eat more wheat if they could afford to buy it the problem would be settled. With the present very low prices one wonders why the consumption is not much bigger.

New Wheat Act

A measure likely to have considerable influence on the milling industry is the Wheat (Amendment) Act of 1939. The principal purpose of the new Act is to define with greater precision the products of wheat milling which attract the quota payment. The Act of 1932 did not define exactly what was flour and what was offal, and it was possible for flour to be imported into this country in the guise of middlings and escape the quota payment. A law suit followed which eventually reached the House of Lords and the Wheat Commission was defeated, hence the amending Act of 1939. This has granted partial or total relief from liability for certain products destined for livestock, which had previously attracted the quota payment in full and also modified the conditions under which exemption was allowed for wheat meal used for animal and poultry food.

Wheat by-products are now defined as those which have an ash content exceeding 2·7 per cent. and which are destined for livestock. This is important, as now cereal foods and wheat germ for human consumption will be liable for quota payment. Livestock means horses, mules, asses, cattle, sheep, pigs, goats and

poultry. It does not include dogs or game. In addition to rendering a return of the flour milled, millers will now be required to report their offal sales.

Flour Treatment

Further regulations which will have far-reaching influence on the milling and baking industries have been drafted by the Ministry of Health, and it is expected that these will come into force in October. It is laid down that there shall not be added to flour intended for sale for human consumption, nor shall such flour be treated with any matter other than the following:

(*a*) Any ingredient for the purpose of making such flour self-raising, and in the case of flour which is intended for sale as suitable for the making of cakes or puddings ingredients suitable for that purpose.

(*b*) Salt, acetic acid, chlorides of nitrogen, sodium or potassium bromate and nitrogen peroxide by the electrical process.

This is a decided change, and the Ministry of Health has adopted the American system of giving a list of permitted substances to the exclusion of anything else. It thus appears that such well-known bleachers as chlorine and benzoyl peroxide and improvers such as ammonium persulphate and acid calcium phosphate will be prohibited. Many millers who use nitrogen peroxide make it by the catalytic oxidation of ammonia—presumably this process will be forbidden.

For the first time flour is defined precisely: "No person shall sell for human consumption flour derived wholly from a cereal or substance other than wheat unless it is described on the container in which it is supplied as Flour with that word preceded by the name of the cereal or substance from which the flour is derived". This disposes of any adulteration of wheaten flour with potato or cornflour.

It is to be noted that this prohibition does not apply to bread. "No flour other than wheat flour shall be used in the making of bread for sale for human consumption except the flours of barley, rye, oats, buckwheat, maize, peas, beans, rice or potatoes." It is difficult to imagine what other flour could be used!

Storage Problems

The Government have taken active steps to ensure greater storage of wheat and flour. Several of the large milling concerns have made purchases of wheat on behalf of the Government, and there are now bigger stocks of wheat in the country than before. Furthermore, bakers have been subsidised to hold substantially larger stocks of flour than usual, and thus the flour stocks are distributed about the country where they will be used. This will mean a big saving of transport. Millers have also been invited to increase their stocks of flour.

Cereal Research

Much research work on all aspects of the cereal industries has been reported during the year. Particularly interesting work has been done on plant genetics and astonishing results have been obtained. Wheat has been crossed with rye and some of the hybrids have better grain than the wheat parent, some show an increase in yield and others have the very hardy characteristics of the rye. Wider crosses have been produced between wheat and couchgrass. These hybrids are perennial like the couchgrass and some are frost and drought resistant and some are claimed to have a greater yield and better quality than wheat.

The main effort in wheat breeding is confined to the more orthodox methods of improving the *vulgare* wheat itself by producing varieties which have a higher yield, are immune to rust and other diseases and which mature more rapidly so as to escape the frosts of northern latitudes.

In Canada the wheat belt is steadily moving northwards, and this is being made possible by the production of varieties which reach maturity in a shorter period after sowing. Work published recently on this includes a paper by Worzella (*Cereal Chemistry*, 1939, p. 188) on Breeding Soft Wheats, and a description of attempts to produce a hybrid from perennial oats and cultivated annual species was published by Johnson and McLennan (*Canada J. Research*, 1939, p. 35).

Bayles and Taylor have described the resistance of wheat varieties. The effects of fertilisers on wheat growth have been studied by Donaldson (*Plant Physiol.*, 1938, p. 737), and the influence of manuring on wheat heads has been described by Cook and Baten (*J. Amer. Soc. Agron.*, 1938, p. 735).

Research on Pests and Fungi

The factors which affect the keeping properties of cereals and their products have received due attention. Jones (*Iowa State Coll. J. Sci.*, 1938, p. 73) has described the control of *tribolium castaneum*, and in the same journal Martin has studied the effect of fumigation on the amylase value of wheat. Work described by Allen and Goddard (*Amer. J. Bot.*, 1938, p. 613) indicates that the respiration of normal wheat is stimulated by mildew.

Much work has been published on rust resistance. Waterhouse (*J. Roy. Soc. N.S.W.*, 1938, p. 1) describes the breeding of cereals for resistance to rust. Stoa and Harris (*N.W. Miller*, 1939, p. 2) describe the rust resistance of various varieties of wheat and taken all round prefer Thatcher. The influence of rust on the nitrogen metabolism of wheat has been investigated by Gassner and Franke, and the former worker has published two interesting papers on the bunt infection of the Turkish wheat crop of 1935.

Baking and Bakery Products

Markley and Bailey (*Cereal Chem.*, 1939, p. 265) have studied the effect of dough mixing on bread quality and found that the increase in mobility on prolonged mixing is not correlated with the damage to bread quality, and the latter is greater for high-protein doughs. Certain new mechanical appliances have appeared. Hummel has patented a mixer using a ball in a bell. Tilting mixers

have been patented by Kemper. Heuwing has protected an improvement in dough shaping and kneading machines by which loosening of the dough from the walls is facilitated. Peters and Wormser have invented a machine for rolling dough into shape for tin loaves. Numerous other patents for handling dough, moulding and twisting have been carried out.

Improvers

It is surprising to note the great activity in the search for so-called improvers. The new regulations referred to above render the recent discoveries stillborn and this is a good thing. If millers would concentrate on milling a first-rate flour and bakers would make an honest loaf out of it many of our nutritional problems would vanish.

Of the many suggested improvers only a few can be mentioned here. Hansen has taken a patent in Denmark for the use of a mixture of potassium bromate and calcium lactate. Scheldemolens has protected in Belgium a rather remarkable improver—a mixture of starch and nitric acid. Noury and Van der Lande, well known in this field, have patented the use of ascorbic acid. They suggest (Dutch Patent 44536) 5 litres of lemon juice per 100 kgm. flour. According to Roswaegne (Belgian Patent 427413) potatoes treated with superheated steam and then ground make a useful improver. One does not hear very much about the physical methods of improving flour these days, and the heat treatment about which great hopes were raised a few years ago does not appear to be widely used.

Bread Staling

This is a problem which is always with us. Endless work has been done on it and the solution seems as far off as ever. Pyler (*Chem. Abs.*, 1939, p. 3010) has investigated the problem from a new angle and has concluded that chemical staling is very difficult to control, but has less effect on palatability than physical staling. Cathcart and Luber (*Cereal Chemistry*, 1939, p. 430) have applied the swelling power as a test for staling. This does not appear very convincing. Glabau (*Mehl. u. Brot.*, 1939, p. 388) has described a photometer for measuring the light transmission of starch paste or bread. The changes with age of the bread are less at freezing point than at room temperature, and less with 10 per cent. milk powder than without.

Analytical Progress

A large number of researches on analytical methods have been published. Two very interesting papers relate to identification of varieties. Voss has discussed methods available for identifying wheat varieties on morphological characteristics, phenol coloration and carotenoid content. Armitage has given tables showing the sizes and appearance of starch grains and various tissues of leguminous seeds that may be found in feeding stuffs.

Papers have also appeared on the determination of starch, protein, carotene, vitamins, and acidity. Much has been published on enzymes and enzymic activity. The period under review has been one of continued activity and much useful progress has been noted.

MASTER BAKERS CONFER AT TORQUAY

EDMUND B. BENNION

THE Annual Conference of the National Association of Master Bakers took place at Torquay during the second week in June. As a result, perhaps, of the perfect weather conditions, the business sessions were not well attended, but the programme was completed according to schedule. The term "conference" is hardly applicable to such functions as these, since the proceedings are more in the nature of an Annual General Meeting than an occasion on which much conferring takes place. Combined with the meetings is the most important social side, which really constitutes the main part of the week's activities and seems to justify the continuance of such functions. Few who attended would have wished for more prolonged sessions—few of those attending at the present time would wish for too many technical papers. The season of the year and the place at which they are held militate against prolonged sessions of intense concentration, and whilst many may lament the absence of technical papers the time of the year for such papers is really the winter, and probably in time the meetings will be held for the specific purpose at a more suitable season of the year.

Trade Board Topics

The conference opened on the Monday afternoon with a discussion on Trade Board Topics. There was a very full discussion, and it was evident that the small confectioner bakers from the North had attended in some force to protest against the proposed rates of pay. They objected to being subjected to the same conditions as the factory bakeries. They thought that there should be special scales and hours for very small businesses, apparently not being able to see that their own arguments could be used with equal force against them. The culminating point was when a so-called responsible member of the Association—the Chairman of the Parliamentary Committee—proposed that all suggested rates should be cut by 10 per cent. for the first three years and then at the end of this period adjusted. It was pointed out that such a suggestion would bring the rates below those now being paid, and the whole proposition was treated with a certain amount of ridicule. Needless to say it was defeated at the vote, for the feeling definitely was that if the right men were to be attracted into the trade then the wages offered and paid must be attractive. Further,

that so far as rural and small bakers are concerned, it will become a matter of organisation and the application of technical knowledge if businesses are to be worked efficiently. A premium will at last be placed on efficiency, and it will be better for the trade that this should be so.

On Tuesday morning the business session was reopened and after a very inadequate review of the work of the Parliamentary Committee, a somewhat lengthy discussion took place, wasting much valuable time, on the subject of reorganisation of representation on the Council by the direct representation of Federations instead of the present area representation. The Conference were asked to support the principle of this alteration so that new rules could be drafted along these lines, to be presented to a meeting of the trade in September. Owing to the way in which the matter was thrown open to discussion there was considerable doubt as to the main issue, and there was the feeling that there was something savouring of sharp practice about the idea. When will the associates realise that it is only businesslike and statesmanlike to have the case prepared when some major issue comes up for discussion? If only there had been an official spokesman on this matter the whole position could have been summarised and presented in less than an hour in such a way that the fruitless discussion which took place could have been eliminated.

It was finally pointed out that when dealing with Government Departments the National Association must speak for the trade as a whole and so the Federations should be represented on the Council. This would mean that anomalies would arise, one of which would be that members of a Federation, not at present members of the National Association, will have official representation without contributing financially to their share of the expenses of the National Association purse. This, however, cannot be helped, for at present such individuals are getting just the same assistance in the same way. It will, however, be a step towards the only true development in trade organisation which should mean that the Federations are integral portions of the National Association and membership of the National Association will thus be an essential part of their membership. Thus the Federations would function through the National Association, the secretaries of each Federation being paid servants of the National Association.

At the present time there seem to be vested interests tending to prevent any such union, but, as in other progressive measures, the force of economic circumstances will compel such reorganisation and the removal of such interests.

Education and Research

The Education Report was brief and no discussion was allowed, since time had to be given for some consideration of the Report of the Research Sub-Committee. The meeting at which this was discussed was exceedingly small, most probably due to the very hot afternoon. Several members spoke in support of the report, and Mr. W. T. Barton supported the scheme and paid tribute to the value of the laboratory in the confectionery industry. He said that it was a business proposition to further this idea of research, and he himself had found it so in his own business. This statement was not without effect. Support for the scheme is steadily coming in, and already a hundred members have promised support.

The Financial Report of the Association was next received with little comment and the work of the Executive was approved.

Part of the time on Tuesday was devoted to receiving addresses of welcome from members of other associations attending the Conference as guests.

On Wednesday morning the new President, Mr. E. Phillips of Bradford, was installed, and many eulogistic speeches were made in support of his election and congratulations were tendered from all quarters of the world. Mr. Phillips has served on the Council for many years and has ever been an indefatigable worker on the Parliamentary Committee and on the Yorkshire Federation, and when on the "floor" of the Conferences has always been a most valuable contributor to the many discussions, generally putting his case with clearness and precision and proving of value in terminating many a fruitless discussion, apart from furthering many progressive ideas. His ideas of twenty years ago are now being adopted, and it should be interesting to see if he can make things move more quickly now he is in the chair. After the ceremonial proceedings of the morning were over, Mr. C. M. Symes read a paper on "Salesmanship for Bakers".

Salesmanship for Bakers

It was regrettable that so little time had been left for the most important paper of the Conference, particularly when one considers how much time had been wasted in mere reiteration of platitudes.

In the paper the importance of planning sales was stressed, and for this purpose much time and thought should be given, the speaker urged. It is necessary to find out not only what your customers like but what they dislike, and then obtain information on which to work. One is always struck by the fact that so many bakers and confectioners produce identical ranges of products, apparently because they think the public want them. Facts are necessary if planning is to be done and surmises are not sufficient.

There are three big factors in bakery salesmanship:

1. Window display and related selling functions—*i.e.* advertising and printed matter.
2. Outdoor selling.
3. Efficiency of the selling staff.

The need for having shops well fitted, well lighted, and goods well displayed was emphasised.

Further, the suggestion was made of keeping the public informed of developments in your business, a photograph of a new machine with some suitable write-up might prove of great interest. Furthermore, news items about the work of the staff might be of interest, the speaker urged. Variety in display and mode of presentation—particularly by the use of well-written display cards—tends to arouse interest and draw people to the shop window.

FOOD POISONING

Part VI.

FOOD-BORNE INFECTIONS

ELLIOT B. DEWBERRY, M.R.I.P.H., M.R.San.I.

IN RECENT years a number of outbreaks have been recorded in which the infection has been transmitted by duck eggs. In 1932 the Ministry of Health called attention to the risk of consuming insufficiently cooked eggs, especially those of ducks. The importance of the duck's egg as conveying Salmonella infection has been brought recently into prominence by the work of Scott.

During 1936 in 5 outbreaks circumstantial evidence strongly suggested a duck's egg as the source of infection; the same cause was suspected in a small outbreak affecting 3 persons who consumed meat rissoles bound with duck's egg. All were instances of aertrycke infection and two were fatal. In all but one instance the suspected egg was imported.

Cooked Foods

Owing to the number of outbreaks which have been associated with cooked foods, such as meat pies, hams, pâtés, etc., investigations have been made by many observers from time to time both in this country, in America and in Germany to ascertain whether the temperature reached in cooking such food is sufficient to destroy any pathogenic organisms that may be present. In some experiments as to the temperature reached in baking meat pies carried out by Delépine and Howarth in connection with an outbreak of food poisoning (meat pies) at Derby in 1902, they noted that the centre of a pie which appeared externally to be well baked (but was really underbaked) did not exceed 47·2° C., and that the centre of a pie which was over-baked had not reached beyond 86·6° C. Furthermore, there was a difference of several degrees between the temperature of various pies.

Delépine pointed out that a batch of pies prepared in a hurry might be so cooked that bacteria might continue to grow in the centres while in the oven and certainly would not be killed. He also came to the conclusion that the outbreak of illness was due to the presence in the pies of *B. enteritidis* (Derby) and that the meat was contaminated before it was baked.

The late Professor Emile Van Ermengem, who in 1896 discovered *B. botulinus*. He demonstrated that it produced the virulent toxin which proved to be the cause of botulism.

Appearance of Infected Food

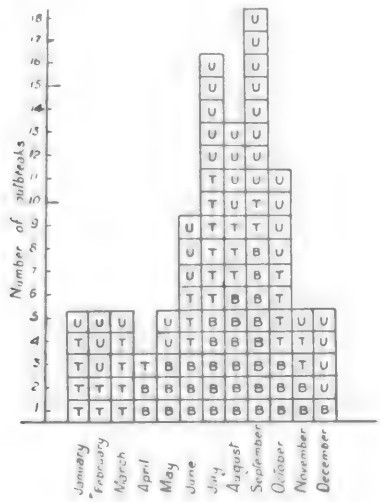
A popular and mistaken idea exists that food to be toxic and dangerous must be tainted or have a suspicious or disagreeable smell. Usually there is nothing in the appearance, taste or odour of the infected article to suggest that it is unfit for consumption; in fact, it generally appears quite normal. It is not surprising, therefore, to find that experienced persons are sometimes led astray.

A striking and melancholy illustration of this took place in Brussels in 1896. A meat inspector examined some saveloys which were suspected of causing illness, and, in the absence of any abnormal signs, passed them fit for consumption. By way of showing confidence in his opinion and to demonstrate their harmlessness he partook of some slices of the food himself. He was attacked by choleraic symptoms of the severest type and died in five days. Van Ermengem, who investigated the outbreak, isolated *B. enteritidis* from his viscera and from the saveloys.

Although a large number of saveloys were made from the same meat on the same day, only four of them were infected, thus illustrating that the distribution of pathogenic organisms in an article of food may be quite uneven.

Very occasionally alteration in the physical appearance of infected meat foods does occur and is detected by a trained eye. Deléphine, when investigating an outbreak at Accrington, noticed that one of the surfaces of the samples of food was smooth and covered with a thin layer of jelly and that the latter was slightly turbid, due to numerous colonies of bacteria. The organisms which usually produce physical changes in food are those causing decomposition, the results of which are so obvious as to prevent the article being consumed.

GRAPH A.



SEASONAL PREVALENCE

100 Outbreaks of Food Poisoning.

B. Outbreaks due to living bacilli.

T. Outbreaks due to toxins of the Salmonella Group.

U. Other outbreaks probably due to living bacteria but causation uncertain.

(After Savage and Bruce White.)

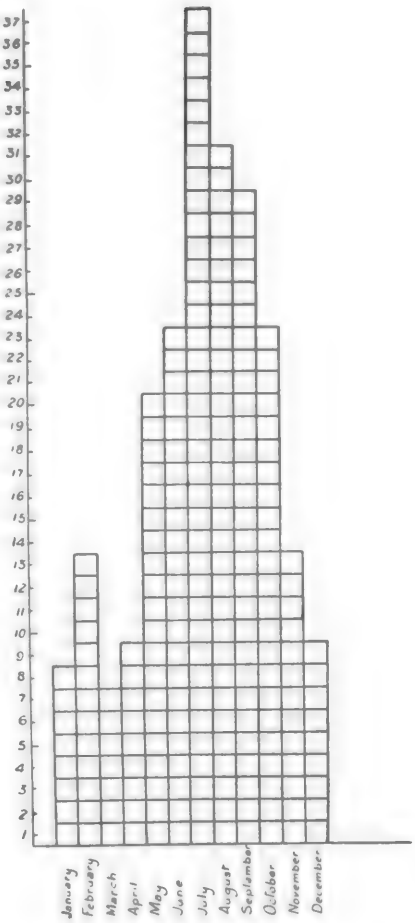
Seasonal Prevalence

The seasonal variation of food poisoning due to Salmonella infections is probably only a result of the rise in temperature during the summer months which favours the rapid multiplication of bacteria in infected foods, thus producing the moderately large dose necessary to cause acute gastro-intestinal symptoms. It is possible that Salmonella organisms have greater virulence in warm weather and that susceptibility to infection by human beings may be increased during the warmer months. It has also been suggested that the seasonal incidence depends to some extent on the proportions of canned and preserved food to fresh food that is eaten. The highest incidence occurs between the months of May and October with "peak" incidence in July.

Modes of Infection

The common ways in which food may be infected by Salmonella organisms are as follows:

GRAPH B.



SEASONAL PREVALENCE

222 Outbreaks of Food Poisoning in Gt. Britain.

(After Savage and Bruce White.)

The consumption of meat from a diseased or infected animal—*i.e.*, beef, mutton, pork and ducks and their eggs.

Milk from an infected animal.

Infected animals which may excrete pathogenic organisms and contaminate food—*i.e.*, bovines, rats and mice. Savage (1931) remarks: "The only sources of infection of which we have accurate information are animals or birds either suffering from Salmonella infections or with bacilli present in a carrier condition. In one group we can include animals used by man for food. Of animals not used for food the most important reservoirs are rats and mice."

Infection transmitted by flies.

Human carriers.

Ante-Mortem Infection

In this country the majority of the reports on food poisoning outbreaks contain little information regarding the health of the animal from which the food is derived. This shows the importance of ante-mortem and post-

mortem examinations of food animals. In the early days Bollinger maintained that the flesh of animals suffering from septic and pyæmic diseases was unfit for human consumption. There seems little doubt that animals, especially cattle and pigs, may suffer from umbilical infections, intestinal and other diseases caused by Salmonella organisms. The disease is usually acute and often fatal, but the carcass need not necessarily be noticeably unhealthy.

In the annual report of the Ministry of Health for 1935, a case occurred in Lancashire, in which beef from the carcass of an animal suffering from Salmonella septicæmia when slaughtered was responsible for 174 cases with 8 deaths. The carcass was not apparently unhealthy, but from all parts of it examined *B. aertrycke* was isolated.

In a number of food poisoning outbreaks due to the consumption of meat from a diseased animal, it has been ascertained afterwards to have been "emergency slaughtered. According to German authorities four-fifths of the meat-poisoning outbreaks are due to diseased cattle slaughtered when on the point of death—slaughter having been effected under private or unascertainable conditions.

Under inadequately controlled conditions, opportunities may occur for the transference of infection from diseased animals to healthy meat where the slaughter of the sick animals takes place in the same room as healthy carcasses are being dressed. The careless handling of local lesions of a diseased animal is also a possible source of infection.

The infection of ducks and their eggs by *B. aertrycke* and *B. enteritidis* is not uncommon. Scott suggests that the eggs are probably infected during their formation in the oviduct, but the bacilli may gain access through the intact shell. In his paper on the subject (1930) he mentions several outbreaks, including a typical one which occurred at Darlington in 1937. A trifle was consumed by 10 out of a party of 12 persons. All the 10 were seriously ill owing to aertrycke infection, while the two who had no trifle but had shared in all the other food remained well. The cream of the trifle had been prepared by whipping the whites of ducks' eggs.

There are many reported outbreaks spread by infected milk in which Salmonella organisms have been isolated in the milk from a diseased cow. Savage quotes a milk-spread outbreak associated with *B. enteritidis*, which was isolated from a cow from the herd supplying the milk, the animal suffering from udder induration. She developed septicæmia and was slaughtered the day following the outbreak. In 1936 a large milk outbreak (130 cases) occurred in Wiltshire, chiefly among school children. Salmonella was isolated from both the milk and from the fæces of the cows supplying it. It is comparatively rare for the mode of transference from the animal reservoir to the human patient to be so clearly established.

Rats and Mice

The contamination of food by the excreta of infected animals is probably more frequent than is generally supposed.

Rats and mice suffer naturally from infection by *B. enteritidis* and *B. typhi-murium* and may excrete the organisms in their fæces and urine for considerable periods. Food prepared and left exposed in infected premises attracts rats and mice and is liable to be infected by their droppings.

Savage and Bruce White (1923) isolated *B. enteritidis* from rats caught in a slaughter-house. The rat is probably the host of this organism and the mouse harbours *B. typhi-murium*. In 1925-26 Meyer and Matsumura made an examination of 775 rats from the district of San Francisco and isolated *B. enteritidis* or *B. typhi-murium* in 58 of the rodents.

In the Annual Report of the Ministry of Health for 1936 the Chief Medical Officer records an investigation of the Salmonella infections of rats by Dr. M. Khalil, which illustrates the importance of the animal reservoir in which the various Salmonella types maintain their existence.

RATS, 1936 (LIVERPOOL).

Rats Examined.	*Number Positive.*	*Percentage Positive.*
250 January to March 175 City 75 Port	44 26 aertrycke 16 enteritidis 2 Newport	17·6
250 April to June 175 City 75 Port	10 1 aertrycke 7 aertrycke 1 Newport 1 Thompson	4·0
250 July to August 175 City 75 Port	1 enteritidis	0·4

It will be seen that several of the types common in food poisoning can be found in the rat in much the same order of frequency; the enteritidis type, however, appears more commonly in the rat than it does in man, and there is reason to believe that it is the rat type in particular, just as the Dublin type is bovine. As regards the other types, individual rats may become infected by them, probably by eating infected food, but, except perhaps in the case of aertrycke infection, rat epizootics apparently do not result from them.

As regards outbreaks, Jones and Wright (1936) record the case of a child who died from eating infected dried milk which was kept in an uncovered container. Mouse fæces were found in the food, and from these as well as from the powder *B. typhi-murium* was isolated. From the intestines of mice caught in the house within the next few days the same organism was cultivated.

Savage says: "The fact that specifically infected rats and mice are vehicles of infection in food poisoning may be taken as established, and the infrequency of actual proof is probably due to the difficulties of the quest and a good deal to the failure of those responsible for collecting material, etc., to grasp the importance of this line of enquiry."

Cultures of bacteria are sold for the extermination of rats and mice. In the Annual Report of the Ministry of Health for 1932 the Chief Medical Officer issued a warning regarding the use of virus preparations. He said: "In 1929, and again in 1931, I called attention to the danger to human beings involved in the use of 'virus' preparations for the destruction of rodents and to the great caution necessary in employing them in circumstances in which contamination of food or drink might occur, either with the virus material itself or by the excreta of rats and mice infected with it. The occasion for this repetition was the outbreak of November, 1931, in which 38 cases of food poisoning and one death were traced to the use of such a virus in a bake-house in Wigan."* The bacillary species in virus preparations are identical with those found in cases of severe and fatal gastro-enteritis in man, and outbreaks do occur, both in this country and on the Continent, directly traceable to the use of virus.

Infection by Flies

With regard to flies being possible vehicles of Salmonella infection, it is well known that these insects assist in spreading many dangerous diseases and that the organisms may be conveyed on their legs, wings and bodies, or in their crops or intestines, but there appears to be no evidence that flies naturally harbour Salmonella bacilli; nor have they been proved to be the cause of food poisoning. Although the seasonal prevalence of these insects and that of food poisoning outbreaks are somewhat similar, the isolated nature of the outbreaks does not seem to favour fly-borne infection.

Human Carriers

Human carriers—*i.e.*, human beings infected from animal sources—may, during illness and for some limited period after, discharge pathogenic bacilli in their fæces and contaminate food by handling. This problem is a difficult one, and proved cases of infection from human sources are very few. There is little evidence that food poisoning organisms are able to live and multiply in the human intestine and they usually disappear on recovery from the illness. Instances, however, have been recorded where *B. aertrycke* has been found in the fæces of persons not suffering from food infection. Temporary carriers may be more common than is generally supposed. Savage (1932) expressed the view that the human carrier plays quite an insignificant part in the causation of food poisoning. In America, however, Jordan and Geiger seemed convinced of the importance of this source of infection. Among food-poisoning outbreaks ascribed to human carriers was one which occurred in France in 1917 and involving some 1,060 cases. It was investigated by Perry and Tidy and was proved to be due to *B. aertrycke*. One case remained positive for 14 weeks.

Mortality

The mortality rate of bacterial food poisoning is distinctly low, but varies in different outbreaks. In the 112 outbreaks with 9,190 cases which occurred in England and recorded by Savage in 1920 it was 1·5 per cent. Some observers give an average of 1 per cent. to 4 per cent. mortality. In America, Geiger estimated it at less than 0·5 per cent. Meyer (1913) in Germany recorded a death-rate of only 1 per cent. in outbreaks due to Salmonella organisms. In milk outbreaks alone Savage and Bruce White found the mortality rate to be less than 0·2 per cent. It would appear that in outbreaks due to living Salmonella organisms the mortality is estimated at 1·2 per cent. to 1·3 per cent., but when due to toxins is much lower and in 31 outbreaks it was only 0·54 per cent.

* From the remains of a tin of this bacterial material, from mice trapped on the premises, from the organs of the patient who died, and from the excreta of other sufferers, Scott isolated bacilli which were identical with one another and with *B. enteritidis*.

Part VII.

BOTULISM

AN HISTORICAL SURVEY

THE word "botulism" comes from Latin *botulus*, a sausage, and is sometimes known as allantiasis, or ichthyosismus.

This comparatively rare but extremely interesting type of food poisoning appears to have had its origin on the Continent, and according to historical records "sausage poisoning", as it was then termed, was prevalent in Germany as long ago as 1735-1789.

Historical Survey

The first recorded outbreak which attracted the attention of the medical profession occurred in Wildbad, near Würtemberg, in 1793 and affected 13 persons, 6 of whom died as a result of eating black puddings ("*Schweinsmagen*" or "*Blünzen*").

The characteristic symptoms and the fatal nature of the illness were brought to the notice of the Court physician (Keiser), who suspected belladonna poisoning, owing to the symptoms somewhat resembling those caused by this vegetable poison. Subsequent outbreaks drew the attention of the authorities to the unsatisfactory methods of preparing cheap meat foods, and in 1802 the Government of Stuttgart published a warning pointing out the dangers arising from the consumption of unwholesome "made-up" meat foodstuffs and issued instructions for their proper manufacture. In spite of the warning, however, sausage-poisoning increased in Würtemberg and cases occurred in other parts of Southern Germany.

(*Continued on page* 316)

COMBINATION BAKING POWDERS

Their Formulation and Composition

Simon Mendelsohn, F.A.I.C.

LEAVENING mixtures of this type are commonly designated as "double-acting" baking powders, in which a combination of sodium aluminum sulphate (S.A.S.) and mono-calcium phosphate constitutes the acid reactant for the liberation of CO_2 from sodium bicarbonate in the chemical aeration of doughs.

Contact of the active ingredients with cold water yields a comparatively low initial leavening effect, due to the retarding influence of S.A.S. upon the more soluble and quicker-acting acid phosphate. This permits a finished dough or batter to be placed aside at leisure, or for convenience, until ready for baking, when optimum leavening efficiency of the activating mixture will, subsequently, be obtained at oven temperatures.

Nature of Reactions

The actual nature of reactions between this combination of baking acids with soda is rendered uncertain inasmuch as the precise transformations with either S.A.S. or mono-calcium phosphate independently with the alkali are still matters of conjecture. Investigations based upon the identities of the saline constituents comprising the residues of these respective reactions have yielded various results depending upon specific conditions imposed by differences in experimental environment.

Hart[1] asserted the validity of the following reaction in leavening functions involving mono-calcium phosphate and soda,

$$(1)\quad 3CaH_4(PO_4)_2.H_2O + 8NaHCO_3 \longrightarrow 8CO_2 + \underset{(tricalcium\ phosphate)}{Ca_3(PO_4)_2} + 4Na_2HPO_4 + 11H_2O$$

but was not sustained by Leach[2] or Jago,[3] who presumed the action to proceed no farther than the formation of dicalcium and disodium phosphates.

$$(2)\quad CaH_4(PO_4)_2 + 2NaHCO_3 \longrightarrow 2CO_2 + CaHPO_4 + Na_2HPO_4 + 2H_2O$$

Kent-Jones,[4] however, cites the possibility of the following reactions occurring simultaneously,

$$(3)\quad CaH_4(PO_4)_2 + 2NaHCO_3 \longrightarrow 2CO_2 + CaNa_2H_2(PO_4)_2 + 2H_2O$$

$$(4)\quad CaH_4(PO_4)_2 + NaHCO_3 \longrightarrow CO_2 + CaNaH_3(PO_4)_2 + H_2O$$

wherein the complex double salts represent the sole residuals. Patten[5] was inclined to assume the reaction between acid phosphate and soda to result in the formation of a tribasic salt, so that any variation in the proportions of alkali would consequently effect corresponding differences in the yields of mono-sodium and disodium phosphates in the final residues.

Davis and Maveety,[6] in their investigation of these reactions, contended that an excess of soda would terminate in tricalcium and disodium phosphate residuals, otherwise a certain amount of the dicalcium compound will be present (*cf.* Equation [2]). These writers therefore assumed the normal reaction to proceed in the following manner:

$$(5)\quad 3CaH_4(PO_4)_2 + 4NaHCO_3 \longrightarrow 4CO_2 + \underset{(tricalcium\ phosphate)}{Ca_3(PO_4)_2} + \underset{(mono\text{-}sodium\ phosphate)}{4NaH_2PO_4} + 4H_2O$$

Equation (1) may as a rule, however, be accepted as representing the reaction that most probably occurs under ordinary circumstances. With S.A.S., the residues developed upon interaction with soda may depend equally as well upon the quantity of alkali immediately available.

$$(6)\quad Na_2SO_4.Al_2(SO_4)_3 + 6NaHCO_3 \longrightarrow 6CO_2 + 2Al(OH)_3 + 4Na_2SO_4$$

Hydrolysis of Double Salt

From another viewpoint, the reaction between S.A.S. and soda may be assumed to involve hydrolysis of the double salt, with the formation of free sulphuric acid, which in turn would liberate CO_2 from the alkali.[7]

$$(7)\ (a)\quad Na_2SO_4.Al_2(SO_4)_3 + 6H_2O \longrightarrow Na_2SO_4 + 2Al(OH)_3 + 3H_2SO_4$$
$$(b)\quad 3H_2SO_4 + 6NaHCO_3 \longrightarrow 6CO_2 + 3Na_2SO_4 + 6H_2O$$

Regardless of the individual reactions between $[S.A.S./H_2O/NaHCO_3]$ or $[M.C.P./H_2O/NaHCO_3]$ the ultimate results of the transformations do not represent a simple aggregate of the two systems when these are intimately associated to yield combination baking powders. These phases are materially complicated by intermediate reactions that ensue between the acid phosphate and S.A.S., aside from the intervention of soda. Rask[8] suggested the possible occurrence of the following hypothetical interactions between these three components of a combination leavening mixture,

$$(8)\quad S.A.S. + M.C.P. + 4NaHCO_3 \longrightarrow 4CO_2 + 2AlPO_4 + CaSO_4 + 3Na_2SO_4 + 4H_2O$$

wherein the accessory reaction,

(9) S.A.S. + M.C.P. $\longrightarrow$ $2AlPO_4 + Na_2SO_4 + 2H_2SO_4$

constituted the intermediate phase. In accord with Equation (8), a formula for an S.A.S.-phosphate baking powder yielding approximately 14 per cent. of CO_2 would involve the following proportions of ingredients.[8]

	Per Cent.
Sodium bicarbonate	26·73
Sodium aluminum sulphate ..	38·51
Mono-calcium phosphate	18·64
Starch	16·12
	100·00

In such stoichiometrical formulation, the total Al of the S.A.S. content would ultimately be obtained as tribasic phosphate ($AlPO_4$) in the reaction residues. Rask[8] stresses the fact that in view of the intermediate reactions, the S.A.S. functions only indirectly as an acid by tentatively inducing a doubling of the neutralising capacity of the mono-calcium phosphate.

Bailey[9] suggested the formula:

	Per Cent.
Sodium bicarbonate	26·73
Sodium aluminum sulphate ..	19·92
Mono-calcium phosphate	13·28
Starch	40·07
	100·00

for a combination powder to yield a similar percentage of total leavening gas. Numerous other formulations have been devised for the purpose, based upon various ratios between the acid media and soda. In commercial baking powders the alkali is invariably present in quantities exceeding stoichiometrical proportions, as indicated in tentative reactions, to ensure keeping quality, particularly in the case of the S.A.S.-phosphate type of the preparation. Manufacturers engaged in large-scale production of the commodity have throughout the years acquired empirical formulæ to meet specific requirements. The latter category includes keeping quality over reasonably prolonged storage periods despite adverse climatic influences, efficiency in use, economy in manufacture, absence of deleterious effects upon taste and colour of bakings, stipulated CO_2 content, etc. The various modifications of formulæ devised to comply with the above characteristics, in addition to localised preferences imposed by established trade practices, nevertheless conform with the mandatory specifications[10] for baking powders in general.

U.S.A. Specifications

Proportions of S.A.S. and mono-calcium phosphate in combination powders are indirectly promulgated in United States Government specifications for two related types of the commodity intended for Federal requisition.[11]

Type D: Total mixture (*i.e.*, S.A.S., mono-calcium phosphate, sodium bicarbonate and starch) shall contain not more than 4·2 per cent. of alumina (Al_2O_3) derived from the acid-reacting components, and not less than 5·5 per cent. by weight of phosphorus pentoxide (P_2O_5).

Type E: Total mixture shall contain not more than 6·2 per cent. of alumina (Al_2O_3) derived from the acid-reacting components, and not less than 2·8 per cent. by weight of phosphorus pentoxide (P_2O_5).

These are to conform to a common requirement in affording a minimum yield of 12 per cent. available CO_2. The following formulation is capable of meeting the specifications for Type D:

	Per Cent.	
Sodium bicarbonate ..	28·00	
Sodium aluminum sulphate	19·60	(×0·2107 = 4·12% Al_2O_3)
Mono-calcium phosphate ..	13·00	(×0·5634 = 7·32% P_2O_5)
Redried corn starch ..	39·40	
	100·00	

wherein, however, a higher yield of available leavening gas is obtained. The following corresponds to a baking powder qualified to conform with requirements for Type E, yielding in excess of 15 per cent. total CO_2, thereby surpassing the stipulated 12 per cent. minimum for available leavening gas.

	Per Cent.	
Sodium bicarbonate ..	29·50	
Sodium aluminum sulphate	24·00	(×0·2107 = 5·06% Al_2O_3)
Mono-calcium phosphate ..	5·00	(×0·5634 = 2·82% P_2O_5)
Redried corn starch ..	41·50	
	100·00	

Proceeding more or less empirically, it has been the custom of large-scale producers of baking powders of the combination type to devise formulæ characterised by neutral residues. S.A.S. and soda being partially balanced, the difference in acidity is compensated by the addition of mono-calcium phosphate. The latter is usually strictly controlled and present in least quantity on account of being the most expensive ingredient of commercial baking powders. A slight excess of soda is then added to the three components of an otherwise neutral system, which is finally diluted with re-dried starch as a dispersing agent to simultaneously reduce the gas content to desired limits.[12]

To obtain neutral residues the reaction values of each of the acid ingredients must be considered. The neutralising capacity of the acid media is an analytical factor that implies the weight of sodium bicarbonate exactly neutralised by 100 lb. of S.A.S. or mono-calcium phosphate, etc. According to the commonly accepted reaction for M.C.P. and soda,

$$3CaH_4(PO_4)_2.H_2O + 8NaHCO_3 \longrightarrow 8CO_2 + Ca_3(PO_4)_2 + 4Na_2HPO_4 + 8H_2O + 3H_2O \text{ of crystallisation.}$$
$$(756) \longleftrightarrow (672)$$

it is evident that $756 : 672 : : 100 : x = 88{\cdot}8$ parts of soda as the theoretical neutralising capacity per 100 parts of the phosphate. In practice, however, this commodity varies from 80 to 85, depending upon the quantity of inert stabilising diluent in admixture. In the instance of S.A.S.,

$$Na_2SO_4.Al_2(SO_4)_3 + 6NaHCO_3 \longrightarrow 6CO_2 + 2Al(OH)_3 + 4Na_2SO_4$$
$$(484) \longleftrightarrow (504)$$

the theoretical neutralising value corresponds to $484 : 504 : : 100 : x = 104$ parts of soda to 100 of the acid. The commercial material may vary from 102 to 105 in accord with its purity, degree of calcination, age, or moisture content. Consequently from a practical standpoint the following criteria for average neutralising values may commonly be accepted:

100 lb. of S.A.S. exactly neutralise 104 lb.
100 lb. of M.C.P. exactly neutralise 82 lb. } of soda.

It would consequently be logical to infer that 200 lb. of a mixture of equal parts of the two acids should be equivalent to a weight of alkali corresponding to the indicated aggregate of their neutralising capacities, or 186 lb. of soda. Experience has demonstrated this weight of mixed acids, however, to be capable of neutralising only 84 per cent. of the alkali, which in the above instance would amount to only 156 lb.

Therefore, reverting to the formula for Type D combination baking powder, for example, it is evident that the 19·6 lb. of S.A.S. at a neutralising value of 1·04 per lb. would be $19{\cdot}6 \times 1{\cdot}04$, or 20·38 lb. soda; and 13 lb. of M.C.P. at 0·82 per lb. amounts to 10·66 lb. soda. Consequently,

19·60 lb. S.A.S.	should	20·38 lb. soda
13·00 lb. M.C.P.	neutralise	10·66 lb. soda
32·60 lb. mixed acids		31·04 lb. soda.

Since 28 lb. of soda are to be used in the formula to ensure the required CO_2 content, the difference between 28·00 lb. and 26·07 lb. (or $31{\cdot}04 \times 0{\cdot}84$) represents 1·93 lb. of soda as excess.

On this basis the formula could be modified to

	Per Cent.
Sodium bicarbonate	26·07
Sodium aluminum sulphate ..	19·60
Mono-calcium phosphate	13·00
Redried corn starch	41·33
	100·00

by compensating the reduction of soda by the requisite addition of starch, while still maintaining the required 12 per cent. minimum for available gas content. The 1·93 lb. or per cent. above designated as excess soda should nevertheless be added to render the finished baking powder predominantly alkaline for enhancement of keeping quality.

Excess Alkali

Some commercial products of American manufacture frequently contain from 2 to 5 per cent. of excess soda, without apparent impairment of taste or colour of bakings. Such excesses of alkali will naturally augment the total CO_2 content, without increasing the percentage of available leavening gas, incident to decomposition of the powder with water.

Quantitative expression of the reaction character of terminal residues of combination baking powders, in terms of acid or alkali, has frequently been subject to investigation. The variables involved in the complexity of decomposition reactions between mono-calcium phosphate, sodium aluminum sulphate, and soda, in the presence of water, are responsible for several interpretations of a residual factor indicative of any one preponderant constituent ascertained by analytical means.

Deficiencies in reaction or inadequate leavening results obtained with a finished product, aside from adventitious deterioration through age or improper storage, may be attributed to one or more of the following effects:

(1) Insufficient mixing.[13]
(2) Strength variations of either of the active ingredients in the instance of an established formula.
(3) Errors in weighing, compounding, etc.
(4) Improper formulation.

The estimation of the so-called "neutral value" of a baking powder can be applied for verification of the reaction of terminal residues of the product while in process of manufacture, or for comparison of competitive brands of similar type. As a means of analytical control prior to release from mixers, the powder can be adjusted to any desired degree of alkalinity provided the formulation is basically correct in other respects. Excessive acidity is conducive to premature deterioration in baking powders, in contrast with the improvement in keeping quality assured by slight excess of alkalinity.

Estimation of "Neutral Value"

Place 1 gm. of baking powder into a 200 c.c. porcelain casserole or large beaker, add hot water to take up sample, then add 6 drops of phenolphthalein solution (preferably 0·5 per cent. reagent), and heat mixture to boiling. Maintain at boiling temperature with constant stirring until CO_2 is totally eliminated. With powders predominantly alkaline the liquid assumes a pink or red coloration of intensity depending upon the amount of free alkali in solution. If the test material fails to assume a pink colour the sample is concluded to be excessively acid. A surplus of N/10 NaOH is then added, and the residual thereof is determined by titration with decinormal acid and the result calculated in terms of S.A.S., since this is the acid reactant usually present in largest amount.

It should be noted that the boiling process, in treating the sample, completes the reaction between acid media and soda, and any excess of the latter as originally present is now converted to the normal carbonate,

$$2NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$$

Assuming the test material to present all appearances of an alkaline baking powder, the test is then continued. Introduce from 4 to 10 c.c. of N/10 H_2SO_4 in 2 c.c. portions, followed by boiling for two minutes until pink colour does not recur. A volume of N/10 NaOH is added, equivalent to the amount of standard acid previously used, and mixture boiled for two minutes. Cool quickly by immersing receptacle in ice water if desired, or proceed with the hot solution, titrating with N/10 acid to permanent disappearance of pink colour. Result may be expressed in terms of c.c. of decinormal acid so required, or directly as soda by the factor 0·8 derived in the following manner:

1 c.c. N/10 H_2SO_4 = 0·0084 gm. soda or 0·0053 gm. sodium carbonate (Na_2CO_3); c.c. N/10 acid × 0·0053 × 1·585 × 100, or c.c. Acid × 0·84 = per cent. excess soda present, on basis of a 1 gm. sample of baking powder.

Assuming a greater volume of N/10 acid than standard alkali to have been required in final titration, then:

(c.c. N/10 Acid − c.c. N/10 Base) × 0·0084 × 100, or c.c. Acid × 0·84 = per cent. excess soda.

Conversely, when more of the standard NaOH than acid is required, then:

(c.c. N/10 Base − c.c. N/10 Acid) × 0·0081 × 100, or c.c. NaOH × 0·81 = per cent. excess acidity as S.A.S. where this is the predominant acid agent.

Since the values per c.c. of final titration reagents are 0·0084 and 0·0081 for soda and S.A.S. respectively, it is advisable to employ the common factor 0·008 in either instance. Adjustment of reaction of baking powder residues can be accordingly effected on the basis of data obtained in the above test. Each 1 per cent. of excess soda in a batch, for example, corresponds to 20 lb. per ton of powder. Neutralisation of this alkaline surplus is attained by addition of an approximately similar weight of S.A.S., or more precisely, 19·2 lb. in accord with the reaction,

$$\underset{(484)}{S.A.S.} + 6NaHCO_3 \longrightarrow 6CO_2 + 2Al(OH)_3 + \underset{(504)}{4Na_2SO_4}$$

from which it is evident that the ratio of acid to alkali is 1 : 0·96. Therefore 20 lb. of excess soda per ton would require 20 × 0·96, or 19·2 lb., of S.A.S for each 1 per cent. surplus alkali in a batch.

With a baking powder containing 1 per cent. excess S.A.S., or 20 lb. per ton, the reciprocal relationship between acid and alkali is to be utilised in accord with the above leavening reaction. Neutralisation is therefore to be effected by the addition of almost a similar weight of soda, or, more accurately, 20 × 1·04 or 21 lb. to a 1-ton batch. In this instance, the factor is derived from the ratio, soda : S.A.S., or 504/484 = 1·04. Accuracy of adjustments is invariably to be verified by repetition of the "neutral" test prior to release of batch from mixer.

In the formulation of the previously cited example for Type D baking powder, an excess of 1·93 lb., or per cent., of soda was calculated. Therefore on the basis of the above analytical procedure, such surplus of alkali would require 1·93 ÷ 0·84 = 2·3 c.c. of decinormal acid for complete neutralisation of residue following decomposition.

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FOOD POISONING

(*Continued from page* 312)

During the years 1820-1822, Justinus Kerner, a noted physician, made thorough investigations into the cause of sausage-poisoning. He subsequently presented reports in which he related the history of the malady and referred to epidemics in other parts of Germany, recording 84 cases with 47 deaths. The disease was afterwards made notifiable, and records reveal that during the period 1735-1874, 920 cases with 366 deaths occurred in Würtemberg. In Northern Germany the disease was comparatively rare. Nevertheless, in 1822 and 1828, the Royal Imperial Government at Arnsberg issued public warnings against the consumption of "semi-solid, sour and malodorous sausage".

Leighton (1923) remarks: "Altogether there would appear to have been about 1,200 cases of botulism in Germany during the past 130 years, with a mortality of 360, or 30 per cent."

There is no doubt that the majority of the earlier outbreaks of poisoning (botulism) in Central Europe was caused by the consumption of certain prepared meat foods, such as smoked visceral sausage (blood puddings or liver sausage—*Leberwürste* or *Blutwürste*), popular foods amongst the poorer classes. These cheap sausages were often eaten raw or partly cooked and sometimes in a semi-decomposed condition. Scientific observers naturally supposed that this food was the primary cause of the disease, and for many years their investigations and experiments were based on this supposition. As time went on, however, this led to considerable confusion, as it was observed that the symptoms were produced by the ingestion of foods other than spoiled sausages.

Discovery of *Cl. Botulinum*

Innumerable theories were advanced from time to time by research workers to account for the poisonous nature of the incriminated foods; these included: chemical agents, putrefactive alkaloids, ptomaines, ferments, vegetable organisms, moulds and other low forms of life.

Yet the primary cause of the disease still remained undiscovered, and it was not until December, 1895, that the causative organism was isolated and described by the Belgian scientist Émile Pierre Marie Van Ermengem (1851-1932), following the investigation of an outbreak of food poisoning that occurred in the village of Ellezelles in Belgium. The illness, which affected some 20 to 30 persons, 3 of whom died, was caused by the consumption of part of a pickled ham, the portion eaten was paler and softer than normal, had a rancid odour and bitter taste, but was not decomposed, and apparently came from a healthy animal. The remainder of the ham had been previously consumed without causing harm. Van Ermengem made a list of the characteristic symptoms of the disease and cultivated a strictly anaerobic bacillus from the remains of the ham and from the organs of the fatal cases. The organism secreted a powerful and deadly toxin in the medium which, when injected into experimental animals (cats), produced the peculiar neuro-paralytic symptoms which were seen in the fatal human cases.

Van Ermengem, by his brilliant discovery, which was afterwards confirmed by other observers, thus proved the causal relationship of the bacillus and its toxin to the disease and put an end to all speculations as to the nature of the poison which caused the recognised symptoms seen in the previous cases of sausage-poisoning. He named the organism *B. botulinus* (now termed *Clostridium botulinum*), and the disease afterwards became known as botulism.

A Rare Disease

For some years after Van Ermengem's discovery the disease was looked upon as rare and of academic rather than of practical importance. It was presumed that a meat product was essential for the satisfactory growth of the bacillus and development of the toxin. In 1904, however, an outbreak, described by Fischer, occurred in Darmstadt amongst 22 persons, 11 of whom died after eating a home-canned bean salad. The contents of the can had a rancid odour, but the beans showed little physical disintegration. A bacillus identical with the botulinus was isolated by Landmann from the remainder of the beans and yielded a toxin fatal to guinea-pigs.

This outbreak drew the attention of observers to the possibility of canned foods of a vegetable nature being also suitable media for the growth of the organism and the deposition of its toxin. In Germany 24 outbreaks of suspected botulism were reported between 1907 and 1923.

Botulism in U.S.A

During the last two or three decades a large number of cases of botulism have occurred in the United States of America, especially in California. The disease was mostly associated with the consumption of canned or preserved vegetables and fruits and attracted considerable attention. The fact that in America home-canning is carried out to such a large extent, and this especially as regards fruits and vegetables, is the real explanation of the relative frequency of the disease in that country.

(*To be continued*)

THE SEPARATION AND USE OF BLOOD PLASMA FOR SAUSAGES

(*Continued from page* 320)

As an example, a slaughter-house handling the following number of animals each week may be considered:

10 cattle yielding	..	27 gallons blood
32 pigs yielding	..	21 ,, ,,
Total ..	..	48 ,, ,,

When no separator is used the pig's blood is incorporated directly in black sausages, while the cattle blood is used for fertiliser selling at a low price.

The selling price of the black sausage is 6d. per lb., hence 21 gallons blood = 210 lb. at 6d. per lb. = £5 5s.

When a separator is used 10 gallons of pig's blood is reserved directly for black sausages, whilst the rest of the blood—*i.e.*, 38 gallons—is separated. This yields 11 gallons red corpuscles and 27 gallons of plasma.

The red corpuscles are mixed with the 10 gallons unseparated pig's blood—*i.e.*, 10 gallons + 11 gallons = 21 gallons = 210 lb. at 6d. per lb. = £5 5s.

The 27 gallons of plasma are used for incorporation in other sausages in the place of flour. These sell at 6d. per lb. Hence 27 gallons = 270 lb. at 6d. per lb. = £6 15s.

Cost of citrate for treating 38 gallons blood is 38 × 5·6d. = 17s. 9d.

Hence the total value of products produced is £5 5s. + £6 15s. − 17s. 9d. = £11 2s. 3d., and the increased value through using the separator £11 2s. 3d. − £5 5s. = £5 17s. 3d.

To this must be added the saving in flour and from it must be deducted the cost of running the separator.

The Pork Butcher

Another case to be considered is the pork butcher who does no slaughtering but who buys the blood.

If the blood costs 13·5d. per gallon + 5·6d. per gallon for citrate—*i.e.*, total cost of 19·1d. per gallon—he obtains the whole of the blood as edible products which can be incorporated directly in sausages at a price of 1·9d. per lb. The value of the sausage is 6d. per lb., so that to amortise his separator he obtains 6 − 1·9 = 4·1d. per lb. on the blood he uses. Assuming he uses 10 per cent. plasma in the sausage meat he reduces the cost of the sausage by 0·41d. per lb., to which must be added the saving in flour.

It will be seen from the above that the greatest savings are effected by the slaughterer, as he turns a waste product into a valuable one, but the profits to be obtained by a butcher who purchases the blood are by no means to be despised. Although the use of serum separators for this purpose have so far been confined to Continental countries where raw products are scarce, it would seem that there should also be possibilities for their adoption in this country.

Finally, it should be pointed out that the values taken in the foregoing examples are those ruling on the Continent. They may be different in other countries, but from the examples given the savings to be expected can readily be worked out in each individual case.

CORRESPONDENCE

Danish Bacon Pig Marketing • C. Skertchly replies

Fruit Wine

The Editor,

DEAR SIR,

The interesting article on Danish bacon pig marketing by Mr. Clifford Skertchly in your July issue slips up in suggesting that the number of pigs eligible for Government subsidy in this country is 2,100,000 per factory. This is the number for the entire industry.

The number of registered curers is given as 583, which makes a violent contrast with Denmark's 84 factories, but the British figure contains a large number of small curers who are little more than pork butchers. The number of factories with an output of more than 5,200 cwts. per annum is 88.

The article also compares the distance travelled by pigs in both countries, it being said that no Danish farmer is more than 16 miles from a factory while the average distance in this country is 115 miles and that the Danes suffer no loss through shrinkage in transit. Actually, 45 per cent. of British pigs travel less than 25 miles, and 60 per cent. less than 50 miles, and farmers whose pigs travel more than 50 miles receive a shrinkage allowance to compensate them for loss of weight en route.

It is said that Danish farmers do not enter into a contract as under the English marketing scheme, yet lower down we are told that the farmers sign an agreement that for a term of years (usually seven) they will market the whole of their pigs through one factory and will conform to its rules and conditions, and again "Danish farmers contract to sell *all* their pigs to the factory", which seems to indicate that the Danish farmer is even more rigidly tied down than the Englishman, whose contract is for only twelve months and is entirely voluntary—that is, he may place some or all of his pigs through the pork market if he wishes.

An editorial note says that the Pigs Marketing Board has made many mistakes but the most colossal was to leave the pork section uncontrolled. This was not the doing of the Pigs Board, which must operate inside Acts of Parliament which have left pork pigs outside the marketing scheme.

Yours, etc.,
W. G. FRASER,
Press Officer, Bacon Development Board.

The Editor,

DEAR SIR,

With reference to the comments on my article "Danish Bacon Pig Marketing", which you have been good enough to send me, if your correspondent reads my article carefully he will see that the figure of 2,100,000 pigs eligible for subsidy is the *national* figure.

With regard to the number of curers, the Bacon Development Board cannot get away from the fact that there are 583 registered curers under the Bacon Marketing Scheme, whereas Denmark has only 84. In addition to our registered curers there are several hundreds (the exact number appears to be unknown) of unregistered curers producing small quantities of bacon.

Re distance pigs travel. The figure of 115 miles was supplied by the British railway companies and confirmed by the Pigs Marketing Board. The Danish figure of less than 16 miles was supplied by the Danish Legation. Your correspondent may be right in saying that 60 per cent. of British pigs travel less than 50 miles. But why ignore the other 40 per cent. of the pigs? Devon and Cornwall supply about 10 per cent. of the total contract pigs, and the bulk of these west-country animals are sent to Birmingham, giving a journey of 200 miles for some of the pigs. Pigs from Dorset and Scottish pigs often travel very long distances. The Bacon Development Board must be aware of these facts. It is precisely these long-distance travellers that raise the average to 115 miles. We all know the case of the pig which last winter travelled alone from the west country to Birmingham by itself and cost the curer about 50s. in transport!

Re contracts, my article states that the Danes do not enter into a contract *as under the English marketing scheme.* The Danish document may be described as a simple agreement compared with the English complicated contract. The Danish farmer knows where he stands for seven years ahead. On the other hand, the English farmer does not know his position for more than a year ahead and consequently has no inducement to lay out capital on bacon pig production. It was hoped that the Bacon Industry Act would give stability to the home pig-producing industry for at least three years, but nobody knows better than the Bacon Development Board that the Act has failed to realise that hope.

All of us who attended the resumed annual meeting of the Pigs Marketing Board on July 20 know that bacon pig producers are not in such a happy position as the penultimate paragraph of the Bacon Development Board's letter would seem to suggest.

Yours faithfully,
C. SKERTCHLY.

The Editor,

DEAR SIR,

In this County the analyses of samples of so-called "fruit wine" have shown, in nearly all cases, the article consists of a sugar solution, artificially coloured and artificially flavoured and to contain a little tartaric (or citric) acid but no natural fruit juice. The drink is usually non-alcoholic and is not therefore entitled to the name "wine", but the principal objection is that it is described as a fruit wine and does not contain any natural fruit juice and it is not fermented. A label describing such an article as fruit "wine" falsely describes the article sold.

It is submitted that bottles containing these drinks should be labelled "Artificial Fruit Wine" or "Synthetic Fruit Flavoured Artificial Wine".

You will appreciate that the object of this letter is to avoid prosecutions on the matter and to give suppliers, if they so think fit, an opportunity to alter the wording of labels applied to artificial "wines" in time for the next Christmas supplies.

May I add that samples will be taken in this County after sufficient time has elapsed for alteration of labels and that proceedings will be taken where any such sample is adversely reported upon.

Yours faithfully,
S. STRUGNELL,
Chief Inspector, Weights and Measures Dept.,
County of Northumberland.

Correction

In the note "Dr. Cruess sails for U.S.A." in our June issue, page 189, it was stated that cod liver oil was being made in Norway from "dried cod fish". This, of course, is not the case, as the oil comes from the cod liver.

THE SEPARATION AND USE OF BLOOD PLASMA FOR SAUSAGES

Large quantities of blood from slaughter-houses are going to waste, or being utilised as cheap fertilisers. Blood has a very high food value and this article describes how it may be treated.

DURING the past year a large number of Serum Separators have been sold in Germany. Strenuous efforts are being made in that country to avoid importation of raw materials and to develop to the fullest extent their home products. Large quantities of blood from slaughter-houses were found to be going to waste or utilised as cheap fertilisers. This blood has a very high food value, but owing to the objection to the consumption of food products made from blood it was not considered possible to utilise it directly as a food.

Composition of Blood

Blood consists of red and white blood corpuscles, fibrin and serum. If the red and white corpuscles are separated from the blood so that the fibrin remains in the serum the material produced is known as plasma. The colour of pure plasma is pale yellow and when heated it coagulates. This property, as well as its power of binding other materials together, makes it very suitable to be added in the manufacture of sausages, in which it substitutes flour. So far as the taste and appearance are concerned, the sausage which is obtained does not differ from the sausage made in the usual way, but it has the advantage that it will not burst when cooked.

For the use of blood in the manufacture of sausages it is only necessary to obtain a separation of the red corpuscles from the blood when the two materials obtained may be used directly in the manufacture. The only practical way of effecting this separation is by means of centrifugal separation, and separators have been designed which are ideally suited for this purpose.

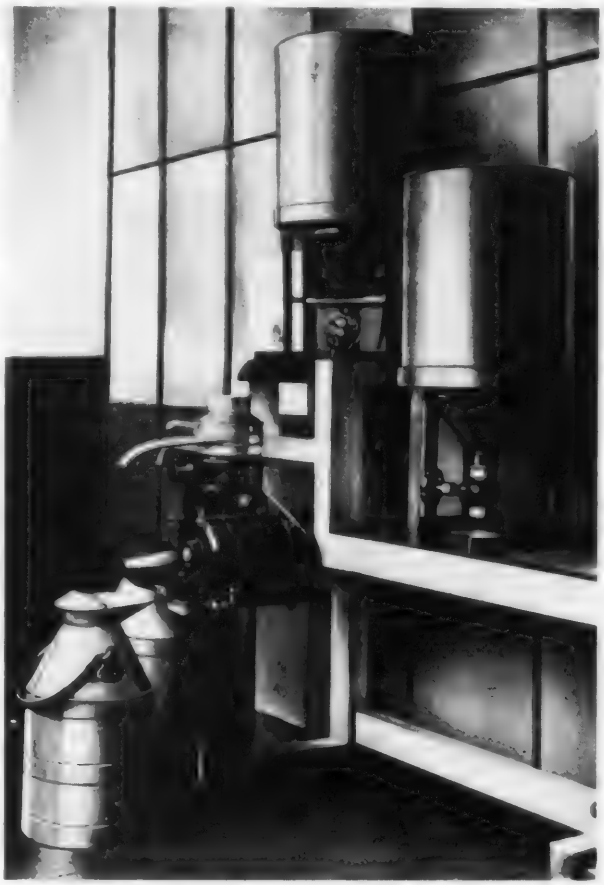
Food Value of Albumen

When it is realised that unstirred blood from beasts contains about 17·7 per cent. of albumen and from pigs 19·2 per cent., it will be seen that 1½ pints of blood contain the same quantity of albumen as 20 hens' eggs, or, in other words, the edible value of blood is practically equal to that of boneless meat.

Before giving details regarding the method of production of plasma it should be mentioned that it can be used for all types of sausages, the quantity being used varying according to taste and the supply. For example, a mixture of 10 per cent. of plasma produces an appetising tasty sausage with a good binding quality. For smoked sausage the required quantity of plasma can be added when the warm sausage is chopped or when it is being ground. In fine liver sausage the plasma is added to the liver, whereas for coarser liver sausage the plasma can be added to the ready-made sausage meat. The plasma could undoubtedly be utilised in many other products of manufacture, and offers a profitable experimental field for butchers.

Red Blood Corpuscles

The red blood corpuscles have also a high food value and can be used in different products, the method of use depending upon the purpose for which they are intended. If they are to be used for the production of red sausage they are thoroughly salted with saltpetre, as is the case



A small De Laval blood separation plant, capacity 10 gallons per hour, installed in a Continental slaughter-house.

when stirred (de-fibrinated) blood is used. For black sausages they are, on the other hand, only lightly salted, about 4·5 oz. per gallon. The red blood corpuscles should preferably be prepared immediately before use, but if this is not possible they must be stirred once or twice daily and kept in a cold room at a temperature of about 42° F. (in any case not below 32° F.). During the production of sausages they are used in the same way as original blood. If it is desired to dilute the sausage paste thus prepared, milk or ordinary citrate-treated blood may be used but not de-fibrinated blood.

Production of Plasma

(a) *Treatment of the Blood*

Blood which is left standing coagulates—*i.e.*, the fibrin forms fibres which bind the red blood corpuscles together in the form of a cake. In order to prevent this the blood is usually stirred and the fibres catch on the whisk as soon as they are formed. This method of treatment is, however, not particularly suitable in the present instance as the fibrin, which has a high food value, is lost. A much better way is to prevent coagulation by addition of materials which do not permit the fibres to form.

Typical materials for the purpose are sodium citrate and sodium oxalate, and in addition there is on the market a patented preparation called "Fibrisol". Both Fibrisol and sodium citrate can be used with good results, and the choice is mainly a question of price. When using Fibrisol the manufacturer recommends that a 6-oz. packet be dissolved in 2½ pints of water and used to add to the blood from one ox or four pigs. From investigations carried out by Messrs. Seinemann and W. Buss, it has been found that the quantity of Fibrisol can be reduced to 0·8 oz. per gallon of cattle blood, and the required amount is dissolved in the proportion of 2 oz. Fibrisol to ½ pint of water. Four oz. is the smallest quantity which is likely to be required at once, since the beast seldom yields less than 2·2 gallons of blood, and the normal amount is 2½ oz. in 12 oz. of water, this amount being suitable for 2·65 gallons of blood. For pig's blood the minimum quantity of Fibrisol was found to be 0·9 oz. per gallon, the Fibrisol being dissolved in five times its weight of water. Again the smallest quantity likely to be required for one pig is 0·8 oz. dissolved in 4 oz. of water. When using sodium citrate 8 oz. dissolved in 3 pints of water is sufficient for each beast. As citrate costs approximately 2s. 6d. per pound and the average yield of blood from a beast is 2·65 gallons then the cost will be 5·6d. to 5·7d. per gallon of blood.

Both of the above materials are difficult to dissolve, and they should be shaken into the water and not *vice versa*. Heating aids solution, and before use it is important that the whole of the solid be dissolved. The solution keeps indefinitely and it is therefore an advantage to make relatively large quantities at one time.

Addition of Citrate

When drawing off the blood from the animal it is of utmost importance to have it mixed with the citrate solution as soon as it leaves the animal. The best procedure is to use a low vessel, approximately 4 inches deep, and holding 5 gallons. When the animal, lying on the floor, has been stuck, the vessel should be pushed under the wound so that the blood flows directly into it, care being taken that the blood jet goes directly into the vessel, mixing immediately with the citrate. As the blood is not de-fibrinated there is no waste from this source. Usually 15 to 20 per cent. is lost in the fibrous mass.

The citrate or Fibrisol-treated blood must be strained and preferably separated immediately. If for any reason the separation must be postponed the blood must be stored at a temperature of 40° F. This is important in order to prevent hæmolysis—*i.e.*, the osmotic pressure causes the red colouring material in the red corpuscles to pass into the serum and to discolour it. Salt must not be added to unseparated blood as this increases the osmotic pressure and the speed of hæmolysis.

(b) *Separation of the Blood*

Before starting the separator, the bowl must be filled with blood in order to prevent the blood corpuscles being broken and to avoid hæmolysis. The plasma should be fed to the collecting tank for blood corpuscles during the first 10 to 20 seconds. As soon as the separation is satisfactory and the blood is of the right colour, the upper spout is moved so as to discharge into the plasma collecting tank. The capacity is controlled by means of the inlet valve and at low throughputs is pale yellow in colour, while at higher capacities the colour becomes more and more red, which is, within limits, no disadvantage.

It is important that citrate-treated blood should not be mixed with stirred blood, whereas plasma, red blood corpuscles, and blood may all be mixed as required provided they are all citrate-treated products.

(c) *Serum Separators*

The De Laval Separators, which were used in practice and upon whose work the preceding figures and details are based, are obtainable in eleven sizes having a capacity ranging from 3·25 gallons to 93·5 gallons of blood per hour.

With the machines running to obtain the foregoing productions a light yellow plasma is obtained, but if the quantity run through be increased by 60 to 70 per cent. then a light pink plasma is obtained. This coagulates upon warming to a light grey-white paste without the slightest trace of red colour. Higher capacities ought to be investigated in each particular case. In certain cases it is proved that the plasma recovered at a lower capacity has a better binding power, the purest plasma being obtained when the regulating screw is screwed in. The yield is not changed appreciably by its adjustment and 65 to 70 per cent. of the blood fed into the separator is obtained as plasma.

(d) *Economics*

To arrive at some indication of the economic advantages obtained by the use of a separator the following figures will be of assistance:

(*Continued on page* 317)

NEWS FROM THE INDUSTRY

PLANT AND EQUIPMENT

Rotary Louvre Dryer with Granulator

The plant in the illustration was designed by Dunford and Elliott (Sheffield), Ltd., in conjunction with Messrs. Jackson and Crockatt, Ltd., for the production of breadcrumbs intended for the sausage trade, and also for use as dressings for hams, fish cakes, etc.

The generally accepted practice in the past has been to dry the bread first of all, and thereafter to grind to the sizing desired, but it has always been found that such a procedure involved the production of an enormous proportion of fines, such fines being practically a waste product.

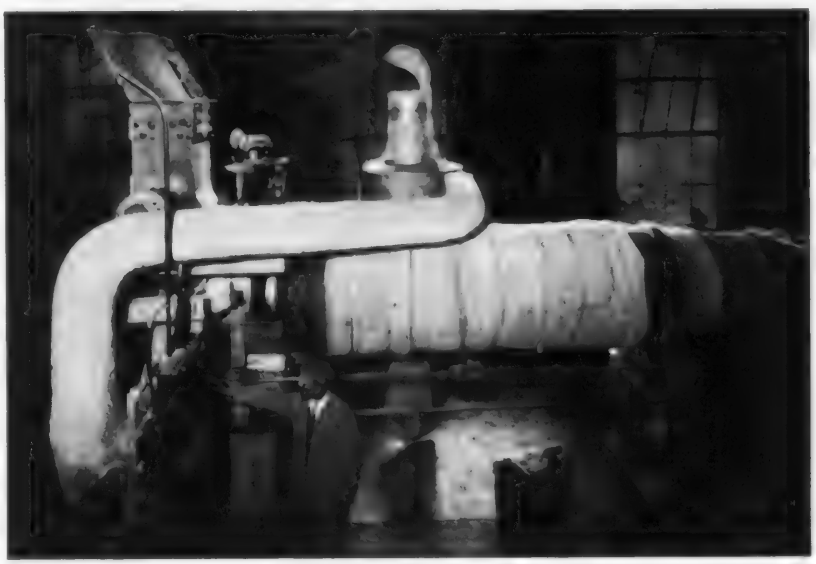
To overcome this disadvantage, experiments were made to granulate the material in its wet state before entering the dryer, and after numerous and lengthy tests a plant has been designed which, by reason of pregranulation, results in only a very small proportion of fines being produced in the discharge from the dryer.

* * *

Factory-Heating Stove

According to the 1937 Factory Act, efficient provision must be made for securing and maintaining a reasonable temperature in each workroom, but no method shall be employed which results in the escape into the air of any workroom of any fume of such a character and to such an extent as likely to be injurious or offensive to persons employed therein.

The experience gained by the use of many systems and various types of stoves, enabled Tangyes, Ltd., to supply stoves for the adequate heating of workshops to comply with the Act. The design has received a great deal of thought, and stoves have been evolved containing some important new features, such as large radiation surface area, maximum heat from fuel, effective control of combustion and interchangeable sections. An example of the amount of coke consumed by one of these stoves capable of heating approximately 60,000 cubic feet of shop space is 44 lb. per eight hours.



Nailed Packing Cases Obsolete

The ordinary type of packing case wastes a lot of wood as well as the case maker's labour by being nailed together so firmly that it has to be opened with a jemmy, the lid being either smashed or lost, and the case rendered unusable again. Quite a new type of packing case fastening was shown at this year's Leipzig Autumn Fair in the shape of iron angle pieces, of which four to six pieces are needed for a case, according to size. These fittings will close a case tightly and securely without using any nails whatever; they have draw hooks passing through the boards and fastened with a wedge and seal. To open the case, the wedges are easily knocked out with a hammer, and as the case remains undamaged it can be used again as often as desired.

* * *

Pumping Installations

In addition to the recently reported pumping installations in course of production at Messrs. Crossley Brothers, Ltd., the following contracts are also in progress. Their diversity is a real tribute to the well-known adaptability of Crossley Oil Engines.

One Crossley six-cylinder vertical Diesel engine, 510 b.h.p., for Tanganyika Central Gold Mines.

Two Crossley five-cylinder pressure-charged Diesel engines, totalling 660 b.h.p., for Downs Dairies, Australia.

Two Crossley five-cylinder vertical Diesel engines, totalling 1,000 b.h.p., for Kalabagh Head Works, Punjab.

Two Crossley four-cylinder vertical scavenge-pump Diesel engines, totalling 220 b.h.p., direct coupled to generators for lighting purposes at Manchester Ship Canal, Eastham Locks.

* * *

Refrigerating Equipment

Contract covering the refrigerating and ice-making equipment for the Food Market and Terminal being built on the Missouri River at Kansas City has been awarded to the Frick Company of Waynesboro, Pa. This municipal project, which is being financed through the P.W.A., comprises a five-storey building with a million and a quarter cu. ft. of cold storage space, and capacity for making 160 or more tons of ice per day.

For handling this work Frick Com-

PLANT AND EQUIPMENT

pany is furnishing three big four-cylinder compressors, in addition to a large two-cylinder machine. The compressors will be driven by direct-connected synchronous motors totalling 900 horse-power. Nearly 113,000 feet of 2-inch piping will be used to cool the storage rooms. The ice-making tank, which is 115 ft. long, will contain more than 1,900 welded ice cans. A complete refrigerated locker system of the "Polar Chest" type will be included. Forty thousand pounds of ammonia will be shipped to the job in a tank car.

* * *

The Universal "AvoMeter"

Model 40 is a new addition to the range of "Avo" Electrical Measuring Instruments and takes the place of the well-known 36 range meter. Its main differences and modifications are the protective cut-out instead of the fuse, three ohms ranges with internal batteries and a fourth using either A.C. or D.C. mains, all having voltage adjustment. The Automatic Coil Winder and Electrical Equipment Co., Ltd., demonstrate their confidence in introducing the new meter as a worthy successor to the 36 range instrument. A descriptive leaflet can be obtained from the company.

* * *

Lining Materials

An agreement has been signed between Messrs. John Thompson (Dudley), Ltd., the well-known fabricators of plant for the chemical, foodstuffs and beverage industries, and Mr. Francis Jaray, of 66, Victoria Street, London, S.W.1, who holds the rights to sell and apply "GaShell" lining materials throughout the British Empire. "GaShell" has been in use in the brewery, wine and cider industries for ten years on the Continent of Europe, but has only been introduced into this country recently.

It is used for the lining of all kinds of containers such as steel tanks, ferro-concrete tanks, wooden vats and casks.

By this agreement Messrs. John Thompson (Dudley), Ltd., are granted the exclusive rights, for the British Isles, to manufacture and sell "GaShell"-lined steel tanks, they undertaking not to sell glass-lined tanks in future.

Mr. Francis Jaray, who will do the actual lining for Messrs. John Thompson (Dudley), Ltd., will, of course, continue to line, *in situ*, concrete tanks, vats and casks and will also continue relining worn or damaged glass-lined tanks.

Industrial Vacuum Cleaning

Vacuum cleaning is now recognised as part of the necessary equipment of an industrial establishment, providing as it does a scientific means of achieving that degree of cleanliness

on which the health of the workers and maximum output so largely depend. Statistics have proved conclusively that where a properly organised system of cleaning has been instituted lost time due to sickness has diminished to a remarkable degree, and epidemic diseases such as influenza are much less virulent in character. In a booklet received from the Sturtevant Engineering Co., Ltd., a description of the achievements of their vacuum cleaning system is well described and the booklet is copiously illustrated.

* * *

Packing Media

There was exhibited at the Fair a particularly comprehensive range of packings which are quite unaffected either by ocean transport or conditions found in the tropics, also attractive lines in wrapping paper, tins, string and a host of other material connected with the proper packing and preservation of articles of various kinds. A special Advisory Bureau was available to enquirers in connection with any form of packing material.

* * *

Potato Crisp Cooking

Our illustration shows a latest type gas-fired potato crisp cooker and cutting machine made by Selas Gas and Engineering Co., Ltd. Of efficient design, it is fired by gas and air-blast on the surface combustion system, by which a bed of refractory material beneath the pan is maintained in an incandescent state, thus localising the heat exactly where required and preventing the waste gases leaving the setting at high temperature.

The pans are of welded aluminium construction, and by means of the handles provided can be immediately removed from the cooker for emptying and cleaning at regular intervals.

The cutting machines are of high-speed revolving-disc type. Each machine is capable of delivering corrugated potato slices at the rate of 1,300 per minute. The slices are projected directly into the cooking oil and are kept entirely separate, a very important point in successful potato crisp manufacture.

The average cooking time cycle is four minutes per batch, composed of one minute for slicing and delivery and three minutes actual cooking. The gas equipment provided is capable of maintaining the oil continuously at correct working temperature to ensure a constant high rate of production.

FOOD (DEFENCE PLANS) DEPARTMENT

Control of Bacon, Hams and Lard

The following appointments have been made in connection with plans for the control of bacon, hams and lard in the event of war:

Director-Designate of Bacon Production: Mr. J. F. Bodinnar.

Assistant Directors-Designate of Bacon Production: Mr. J. Kirkpatrick, Mr. H. Martin-Lewis, Mr. M. R. Welsh.

Director-Designate of Pig Supplies: Mr. J. A. Fox.

Assistant Director-Designate of Pig Supplies: Capt. G. Deakin.

Director-Designate of Bacon Imports: Mr. E. R. Tidmarsh, C.B.E.

Assistant Director-Designate of Bacon Imports: Mr. J. Loudon.

Director-Designate of Bacon and Hams Distribution: Mr. G. Huskisson, D.S.O., M.C.

Assistant Directors-Designate of Bacon and Hams Distribution: Mr. G. A. Hopton, Mr. A. S. Warren.

Director-Designate of Lard: Mr. A. F. Sheed (senr.).

Assistant Director-Designate of Lard: Mr. W. H. Crook.

* * *

Divisional Food Office

Under arrangements made by the Food (Defence Plans) Department, the headquarters of the Divisional Food Officer for the London Metropolitan Police Area (Brig.-Gen. J. M. Young, C.B., C.M.G., D.S.O.) and the Deputy Divisional Food Officer (J. R. P. Postlethwaite, C.B.E.) have been established at Government Buildings, Bromyard Avenue, Acton, W. 3.

BROADCAST

V. L. S. Charley Broadcasts

Our valued contributor V. L. S. Charley, of Long Ashton Research Station, has prepared a programme on the history of cider-making in poetry and prose to be broadcast from Bristol on September 4. The cider industry is unique in possessing a textbook entirely in poetry by John Phillips (1676-1709), the Oxfordshire poet. In his work "Cyder"—a poem—he gives an exact account of apple-tree culture and cider production interspersed with many compliments to his friends and patrons. This programme, under the title "The Cyder Land", will be repeated in the Regional on September 5.

Control of Dried Fruits

In connection with their plans for the control of dried fruits in the event of war, the Food (Defence Plans) Department are compiling lists of importers, brokers and dealers engaged in the trade in dried vine fruits (currants, raisins and sultanas) and dried tree fruits (figs, dates and all evaporated fruits). The term "dealer" relates only to primary wholesalers—*i.e.*, wholesalers who obtain their supplies direct from importers or brokers—and not to secondary wholesalers—*i.e.*, wholesalers who purchase from primary wholesalers—nor to retailers.

Applications for inclusion in the lists should be made as soon as possible to the Director, Food (Defence Plans) Department, Great Westminster House, Horseferry Road, S.W. 1, and should in every case state whether the firm making application are importers, brokers or dealers.

PRESENTATION

Long-Service Presentation

One hundred and two Rowntree employees who have this year completed twenty-five years' service were recently guests of the company. Each guest was presented with a long-service certificate, and a gift of their own choosing had already been distributed.

Mr. W. Payne, Melangeur Department, in proposing a vote of thanks to the directors said, among other things, that since they had been with Rowntrees they had seen wages raised, hours reduced, democratic methods applied, and a higher degree of security introduced through such measures as the Widows' Pension Scheme, the Unemployment Scheme, and the Invalidity Fund.

In replying, Mr. G. J. Harris, Chairman of the York Board, said that the guests had now joined a company of over 1,200 men and women who had more than a quarter of a century's service with the company. He pointed out that almost as soon as they had started the Great War broke out, and in the general upheaval they were called upon to shoulder jobs and responsibilities which normally would have rested on older and more experienced shoulders. It was largely due to them and their contemporaries that the firm were enabled to carry on work of national importance during those critical war years. Mr. Harris proceeded to sketch the difficulties of post-war conditions. He expressed satisfaction that by reason of the presence of such a large body of well-tried seniors upon which the directors could depend the firm could now face the future with confidence.

* * *

New Vitamin A Concentrates

Arrangements are now being made for the world-wide distribution of a new and improved vitamin A concentrate, developed in the research laboratories of Biochemical Products Corporation, of Evanston, Illinois, U.S.A.

Concentrates from 1,000,000 to 2,500,000 units of vitamin A per gram are possible commercially, and the concentrate has the important qualities of crystal-clearness and freedom from undesirable odours and flavours.

By a newly developed process, which is a radical departure from all existing methods used at present, and one of the most important contributions made to vitamin technology for many years, natural vitamin A oils, derived from the livers of various species of fish, are treated in such a way that the pure vitamin A is recovered in highly concentrated form.

Vitamin A esters from fish liver oils are also being produced under another newly developed process, and the ester concentrate provides a natural ester, free from fish oil, and available in much higher potency (it is claimed) than any vitamin A ester at present on the market.

Commercial operations are now in progress, and plans for the marketing of the new concentrates are rapidly being developed through the foreign and domestic sales departments of S. B. Penick and Co., of New York.

NEW APPOINTMENTS

Stafford Allen Appoint Two New Directors

Stafford Allen and Sons, Ltd., have appointed two new directors, Mr. Roger K. Allen and Mr. R. Peter Merritt, Ph.C. Both have been working with the company for some years.

Prior to this Mr. Merritt obtained his degree, and Mr. Allen, who represents the fourth generation of his family in the business, worked in Germany and in France, where he spent a few months with Charabot et Cie, of Grasse, studying the perfumery industry.

Flavours and Colours

As specialists in the supply of flavours, colours, etc., the House of Bush has continued to serve the Confectionery Industry during the past year by maintaining the high standard of their products.

Fruit flavours, colours, etc., can be supplied to cover the whole range of confectionery. Prominent amongst their essences are two series, the Standard No. 1 quality for fondants, jellies, etc., and another specially prepared to withstand high temperatures in boilings—Essential Oil of Peppermint, Mitcham and American, also Citrus Fruit Oils, including Oil of Grapefruit and Oil of Orange, Californian Cold Pressed, both produced at their Californian factory—complete ranges of harmless artificial and vegetable colours to meet the requirements of all food laws.

Arrangements are being made to supply colours which will conform to the regulations of the U.S.A. Federal Food, Drug and Cosmetic Act, which comes into force next year.

A special feature of last year's Confectioners' Exhibition was the display of Fruit Concentrates prepared in the Model Fruit Products Factory. Those concentrates have proved an unqualified success, and although the factory was only opened in May of last year, its output has exceeded expectations.

The concentrates are prepared in two series for confectionery work:

(1) "Eesi-Flo" Fruit Concentrates for Fondants, Jellies, etc.

(2) Fruit Concentrates "95" for boilings, centres, and gums.

Both types are guaranteed to contain a minimum of 95 per cent. concentrated juice—the "95's" have been specially prepared to withstand high temperatures for boiling. The range includes, among "Eesi-Flo" Fruit Concentrates, Blackberry, Greengage, Loganberry, Blackcurrant, Lemon, Pineapple, Cherry, Lime, and Strawberry.

Fruit Concentrates "95" include Blackberry, Cherry, Raspberry, Blackcurrant, Loganberry, and Strawberry.

A noteworthy feature of the past year has been the adoption of the "Eesi-Flo" Concentrates by several manufacturers of high-class boilings. For manufacturers desirous of incorporating genuine concentrated fruit juice as a flavouring agent in their confectionery, the "Eesi-Flo" series is recommended.

A service which has been appreciated by many manufacturers is the supply of flavours and/or coloured confectionery, thus obviating the expense of preparing small batches.

This service, together with a supply of working samples, is available to all interested.

LITERATURE RECEIVED

Bread Pamphlet for Doctors in Third Edition

A third printing of 50,000 copies of the professional booklet entitled "The Physician and Our Daily Bread" has been issued by the Department of Nutrition of the American Institute of Baking.

The three printings of this scientific pamphlet on bread have totalled 100,000 copies, of which approximately one-half have been distributed by the Institute and by local bakers to physicians, dentists, nurses, home economists, and other professional workers throughout the country.

Since all statements in this attractively printed 20-page booklet have been accepted by the Council on Foods of the American Medical Association, it is regarded as authoritative by professional groups.

Quantities of this pamphlet for local use are available at cost price from the Department of Nutrition, American Institute of Baking, 9, Rockefeller Plaza, New York, N.Y.

Public Analysts' Reports

The "Abstract of Reports of Public Analysts for the year 1938", mentioned elsewhere in this issue, is a summary of the reports of all Public Analysts in England and Wales on samples submitted to them by authorities enforcing the food and drugs law.

The pamphlet, in addition to tables showing the number of samples taken in various districts and the types and number of samples of foods and drugs found to be adulterated, contains a detailed summary of the actual findings of Public Analysts. It should be of value and interest alike to those in the food and drugs trade and to those concerned with the enforcement of the law. The pamphlet may be obtained at a price of 4d. net.

* * *

Biscuit Machinery

We have received a full range of booklets showing modern types of mixing machinery, brakes, caramel and jap-cutting machinery from William Brierley, Collier and Hartley, Ltd.

EXHIBITIONS

Glasgow Housing and Health Exhibition

A Canadian section has been organised covering approximately 1,200 square feet. The following firms are taking part:

Libby, McNeill and Libby, Ltd., Food Products.

A. C. Fincken and Co., Food Products.

R. Caldwell, of Glasgow, Food Products.

Canadian Easiways, Ltd., Food Shredder.

Sterling Engineering Co., Ltd., Washing Machines.

G. Havinden, Jellies, Flavours, etc.

Gilbert Porteous, of Glasgow, Milk Shakes, Fruit Flavours, and Ice-Cream.

Beatty Bros., Ltd., Electric Washing Machines, Ironers, Vacuum Cleaners, etc.

Hurley Machine Co., Electric Washing Machines.

Millard Bros., Ltd., Waterless Cookers.

The food products listed above include all varieties of bottled, packaged and canned cereals, vegetables, fruit, syrups, etc. The Exhibition is being held at Kelvin Hall, Glasgow, from September 27 to October 21, 1939.

Foire de Paris

For thirty-one years the *Foire de Paris* has been an annual event, but never before has its success been more brilliant or its aim more fully realised than this year.

An exceptional number of foreign buyers attended from all parts of the world, more especially from Belgium, Holland, Great Britain and Switzerland. As a result, export orders were greatly in excess of those of the previous year, as were also those placed by home buyers.

Thirty-one countries were represented by 659 exhibitors, of whom 357 were included in their respective national sections, with the remaining 302 in the technical sections appropriate to the exhibits.

Foreign buyers showed great interest in the Packing Section. Exhibits that held their special attention were the semi-automatic machines for packing, and the different means of wrapping goods in paper.

The machinery exhibits covered an area of 8,800 square metres of hall space, an increase of 1,600 square metres since the last fair, and outside they covered 4,551 square metres, or 500 square metres more than in 1938.

The Food and Wine Halls still remained the greatest attraction.

INFORMATION AND ADVICE

Free Fatty Acids—Potted Meat—Bouillon Cubes—Information Supplied

Free Fatty Acids

5,568. *Could you advise us of the procedure used in determining the free fatty acid content of tallow and fats?*

It would be appreciated if the above could be given in the language which a layman would understand. (Middlesbrough.)

Oils and fats contain more or less fatty acids according to the conditions of manufacture, age and storage. The amount is expressed in the number of milligrams of potassium hydroxide required to neutralise the free fatty acids in 1 gram of the oil or fat.

Twenty grams of fat or oil are weighed into a flask and 50 c.c. of neutral 95 per cent. alcohol are added. The mixture is warmed and shaken.

A 0·1 N solution of potassium hydroxide is required, and you could obtain this from your local chemist. If you desire to make it yourself it would require to be standardised, which is a matter for the analytical chemist. However, instructions for preparing this can be found in any elementary textbook on analytical chemistry. The potassium hydroxide solution is placed in a burette. After adding a few drops of an alcoholic solution of phenolphthalein (this can also be obtained from your chemist), the solution of potassium hydroxide is added carefully until a pink colour remains permanent. (Note: the pink will, after remaining for a short time, gradually fade again, so that this operation must be done rapidly.) Calculate the number of milligrams of potassium hydroxide required to neutralise 1 gram of the substance taken, having in mind that 100 c.c. of the potassium hydroxide solution contains 5·6 grams of the potassium hydroxide.

We have attempted to put this in as non-technical language as possible and trust that it will serve your purpose.

Potted Meat

5,570. *We should be obliged if you would kindly send us instruction on the manufacture of potted meat.* (Ipswich.)

Potted meats must not contain extraneous material except spices. A small quantity of cereal may be present as a binder, but not as a make-weight, and should be very limited in quantity. The moisture content of potted meats should not exceed 70 per cent., and the recommendations are that no added cereal matter should be present. At present, no legal standards exist for potted meats or pastes, but there has been considerable discussion on this matter for a good many years. In preparing the potted meat the raw or cured meats are first cooked until tender in a minimum amount of water, the tougher meats being added to the cooker before the more tender. When cooking is complete, the solid meats are withdrawn and allowed to cool. The stock is retained. The cooked meats are then passed through a mincing or grinding machine and transferred to a mechanical mixer, in which they are thoroughly incorporated with the seasoning and a proportion of the stock derived from the cooked meats. The mixed paste is again passed through the grinding machine to impart the final degree of fineness and filled into jars or cans and processed.

The above details are taken from an article by J. W. Black which appeared in the July, 1939, issue of FOOD MANUFACTURE, and we suggest that this article would be helpful for you to read.

Bouillon Cubes

5,607. *We are interested in securing a formula for the manufacture of bouillon cubes.*

Can you supply us with this, or advise us where we may obtain it?

Any co-operation you may be able to show us in this matter will be greatly appreciated. (New York.)

There are, of course, a large number of alternative formulæ for bouillon cubes. The main constants are meat extract, "vegetable extract", yeast extract, salt, caramel, beef powder and farina. Farina may be taken purely as a filler, and its quantity must be governed by the price at which the cubes are desired to be sold. It is also important that you ascertain the nature of your local regulations governing the composition and description of the article you wish to manufacture. The main value of bouillon cubes resides, of course, in the extracts both from the flavouring and stimulating points of view. Whatever the proportions of these two may be, farina will affect the moisture content, and after mixing the original materials it is necessary to dry off to such an extent that the final moisture ranges between 8 to 12 per cent.

Information Supplied

5,379. *As you are probably aware, malt and oil is particularly liable to seep through the bottle capping, no matter how effective this may be, and we should be glad if you could give us one or two names of firms who specialise in sealing, with the object of ensuring that seepage does not occur.* (London, W.C.)

Names of firms were given.

5,627. *We would esteem it a favour if you would tell us the name and full particulars of the firm where we could obtain the aluminium foil paper 0·01 mm. thick, protected on both sides with waxed paper, as mentioned in your copy of* FOOD MANUFACTURE, *October, 1937, to be found on pages 344 and 345, reference to refrigeration of poultry as stated for Box III.* (Lancashire.)

The names of some firms were given.

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RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

Ice-Creams; Preparing Dried Milk; Cocoa Preparations

Milk-soluble alginate compounds are prepared by combining an alginate (or alginic acid and a neutralising agent) with a water-soluble salt of an acid whose calcium salt is insoluble; or adding a neutralising agent to a mixture of alginic acid and an acid whose calcium salt is insoluble. Suitable salts are trisodium, monosodium, disodium and other soluble phosphates, and sodium caseinate or milk powder, and a suitable acid is phosphoric acid. Sodium hydroxide or other strongly basic substance is added when necessary to increase the *p*H. Substances such as salt, sugar, or milk powder may be added to facilitate drying of the product. The product is suitable for adding to milk which is to be dried, in order to make the resulting powder suitable for making reconstituted milk, and cocoa or chocolate and sugar may be added for the production of a stable chocolate milk; the product is also suitable for adding to an ice-cream mix, and a dry ice-cream mix containing the product can be reconstituted to a wet ice-cream by adding water or milk.

502,609. Haddan, R. (Kelco Co.).

Preserving Cream

Cream with a fat content of at least 40 per cent. by weight is stored at below −5° C. and subsequently used for making butter. The cream may be filled into tins or other containers and stored at −10° to −12° C., and when required for use is heated slowly and uniformly to 10° to 12° C.

503,896. Naamlooze Vennootschap Linthorst-Koelhuis en Ijsfabrieken.

Coffee, Cocoa, and Tea

Drugs, foods or aqueous extracts thereof containing caffeine or theobromine are rendered non-toxic either by moistening the dry substances with an aqueous solution of adenine or by adding adenine to their aqueous extract. The total quantity of adenine should equal the amount of caffeine, but it should be noted that in the case of tea a certain amount of adenine is present initially. The adenine may be provided in conjunction with sugar cubes or powdered milk tablets as a carrier or incorporated with a constituent such as roasted fig to be added to coffee.

505,131. H.A.G. Coffee Co., Ltd.

Medicines; Foods; Manures

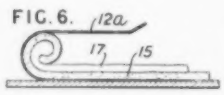
Hygroscopic substances of animal origin are treated to render them non-hygroscopic by coating their particles with a mono- or diglyceride of a higher fatty acid. Materials to be so treated may be of medicinal nature—*e.g.*, bile salts or liver concentrate—meat extracts and artificial manures. A suitable method of application is by mixing with the moist animal product a paste or dry preparation of the glyceride, drying and powdering the mixture. A proportion of glyceride about 5 to 15 per cent. of the dry animal product is suitable. In applying the method to liver extract, comminuted liver is boiled in water, filtered, the filtrate concentrated, alcohol is added to a concentration of 70 per cent., and the precipitate filtered off. The filtrate is concentrated *in vacuo* to about 35 per cent. moisture and poured into 7 volumes of absolute alcohol to dissolve glucose and other undesired substances, the alcohol is decanted and the residue mixed with, *e.g.*, monostearin, dried and ground. In treating meat extract it is mixed with 10 to 15 per cent. monostearin paste and dried. In treating fertilisers, 5 to 15 per cent. of glyceride may be used.

505,362. Armour and Co.

Ice-Cream; Food Preparations

In the production of a composite ice-cream cake roll the cake dough contains cake flour, a substantial quantity of soya-bean flour, and sufficient shortening to impart to the baked cake moisture and flexibility retaining qualities. The dough is baked for 3 minutes at a relatively high temperature—*e.g.*, 600° to 650° F., so that steam is generated during the baking without extracting an appreciable amount of moisture from the dough, and to prevent the formation of a crust. The following proportions of ingredients are referred to: 120 lb. of granulated sugar, 30 lb. of vegetable shortening, 12 lb. of soya-bean flour, 2 lb. 5 oz. of baking soda, 2 lb. 5 oz. of table salt, 45 lb. of whole eggs, 20 lb. of Dutch process cocoa, 15 lb. of sweetened skimmed condensed milk, 132 lb. of soft winter wheat cake flour, 280 lb. of water, and 5 lb. of baking powder. A steamy atmosphere is maintained in the oven—*e.g.*, by closing the oven damper. The dough is baked in pans having paper liners on their bottoms, and the baked cakes are removed from the pans with the aid of projecting flaps on the liners, or the pans are inverted to deposit the cakes upon a paper liner 12*a*, which, as shown, is used to facilitate the rolling up of the cake 15 after the application of the ice-cream layer 17. The roll is then refrigerated to render it self-sustaining. If the cakes are to be transported before being associated with the ice-cream, they are packed in cartons with the paper liners interposed.

FIG. 6.



505,472. Newly Weds Baking Co. and Angell, P. M.

Beverages; Vinegar; Food Preparations

In a process for obtaining coconut oil from coconut meat by mixing the comminuted meat with water, pressing, and separating the oil emulsion, (*a*) the aqueous extract is used for acetic or alcoholic fermentation or, after the addition of sugar and allowing to ferment, for the production of a coconut toddy; (*b*) the separated pressed meat, when obtained from fresh peeled comminuted meat, is dried and used as a desiccated coconut; and (*c*) protein material separated from the oil emulsion is used for human food.

505,277. Lava, V. G.

Complete Specifications Accepted

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

505,780. Raynolds, J. W.: Containers for foods and beverages.
505,754. Cohn, M.: Preparation of baked products from seeds, fruits or vegetables.
505,515. Battle, T. G.: Power-driven means for removing eyes and damaged portions from potatoes, or for similarly treating other vegetables or fruit.

Latest Patent Applications

15425. Basset, L.: Preparation of concentrated coffee essence. May 24.
15424. Frears, Ltd., Frears, R. E., and Beerman, E. W.: Method of packeting biscuits. May 24.
15109. Jones, C. R., and Greer, E. N.: Process for treating flour to remove objectionable smells, etc. May 20.
15004. Jacob, L., and Jacob, L. A.: Containers for ice-cream, etc. May 19.
14388. Stephenson, S.: Storage containers for bread, etc. May 15.
14642. Weizmann, C.: Yeast preparations. May 16.
18824. Hobart Manufacturing Co.: Food-handling apparatus. June 28.
18590. Hiron, H. W. M., Larsen, M., Zeuthen, C., and Zeuthen, R.: Method for the pasteurisation of fluids. June 26.